TEACHERS' ICT USE IN TURKEY, FINLAND AND SOUTH KOREA: A MULTI-CASE STUDY

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ABSTRACT

TEACHERS' ICT USE IN TURKEY, FINLAND AND SOUTH KOREA: A MULTI-CASE STUDY

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This study aimed to investigate the differences and similarities amongst Turkish, Finnish and Korean education systems in terms of the aspects affecting teachers' ICT use in the classroom within the boundaries of a Multi-Level Ecological Perspective (Zhao & Frank, 2003). The purpose of creating a comprehensive understanding of the aspects that enable or inhibit teachers' educational ICT-related practices across national, school and classroom level environments led the study. To achieve this purpose, a comparative case study approach was employed. Data were collected from 19 Finnish, 20 South Korean and 21 Turkish participants.

With the help of semi-structured interview method and informal direct observations, perceptions of the teachers from grade 1 to 12, school administrators and ICT coordinators/advisors regarding the ICT integration in terms of teaching and learning processes were revealed. Additional data to support the interviews and observations were provided by reviewing the relevant documents collected, field notes and photos taken during the 4 month visits made to each country respectively.

An inductive and thematic analysis was performed in order to determine, address and interpret the observable patterns based on the available data. By comparing the current state of technology integration in Turkey with the status of other analyzed countries, it was intended to share the conclusions derived from the experiences and statements of participants working in different countries accordingly. This way, it was aimed to give an idea about the improvements that can be made regarding technology integration in Turkey.

The presentation of findings of the study and their discussion were structured at macro, meso and micro level. Surprisingly, it was discovered that the availability of technological devices and a proper infrastructure at the learning environment did not necessarily ensure a high level of technology use at the classroom level and this situation applied to each analyzed country. Additionally, it was also observed that the most of the participants did not even use the available technologies extensively.

Keywords: Teachers use of ICT, Multi-level Ecological Perspective, Technology Integration into Education, South Korea, Finland

ÖZ

TÜRKİYE’DE, FİNLANDİYA’DA VE GÜNEY KORE’DE ÖĞRETMENLERİN BİT KULLANIMI: ÇOKLU VAKA ÇALIŞMASI

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Bu çalışmada, öğretmenlerin sınıf içindeki BİT kullanımı açısından Türkiye, Finlandiya ve Kore eğitim sistemleri arasındaki farklılıkların ve benzerliklerin, “Çok Düzeyli Ekolojik Sistem Perspektifi” sınırları dahilinde araştırılması amaçlanmıştır (Zhao ve Frank, 2003). Öğretmenlerin ulusal düzeydeki, okul düzeyindeki ve sınıf düzeyindeki eğitim ortamlarında BİT ile ilgili uygulamalar yapmasını mümkün kılan veya bu uygulamalar karşısında engel teşkil eden unsurlar hakkında kapsamlı bir anlayış oluşturma amacı, bu çalışmaya yön veren etken olmuştur. Bu amaca ulaşmak için karşılaştırmalı vaka çalışması yaklaşımı benimsenmiştir. Veriler 19 Fin, 20 Güney Koreli ve 21 Türk katılımcı üzerinden toplanmıştır.

Yarı yapılandırılmış görüşme tekniği ve gayri resmi nitelikteki doğrudan gözlem tekniği kullanılarak, 1. sınıflardan 12. sınıflara kadar derse giren tüm öğretmenlerin, okul yöneticilerinin ve BİT koordinatörlerinin ya da ilgili danışman öğretmenlerin, BİT entegrasyonuna ilişkin öğretme ve öğrenme süreçleri ile ilgili algıları ortaya konmuştur. Ayrı ayrı her bir ülkeye gerçekleştirilen 4’er aylık ziyaretler esnasında toplanan ilgili belgeler, saha notları ve çekilen fotoğraflar incelenerek yapılan görüşme ve gözlemleri destekleyecek ek veriler elde edilmiştir.

Mevcut verilere dayalı olarak gözlemlenebilen örüntüleri belirlemek, ele almak ve yorumlamak için tümevarımsal ve tematik bir analiz yapılmıştır. Türkiye'deki teknoloji entegrasyonu ile ilgili mevcut durumu, incelenen diğer ülkelerin durumu ile karşılaştırarak, farklı ülkelerde görev yapan katılımcıların deneyimlerinden ve beyanlarından elde edilen çıkarımların paylaşılması hedeflenmiştir. Bu şekilde, Türkiye'deki teknoloji entegrasyonu açısından yapılabilecek iyileştirmelerle ilgili fikir vermek amaçlanmıştır.

Çalışma bulgularının sunumu ve tartışma kısmı makro, mezo ve mikro düzeyde yapılandırılmıştır. Şaşırtıcı bir şekilde, öğrenme ortamında teknolojik cihazların ve uygun bir altyapının mevcut olmasının, sınıf düzeyinde ileri derecede teknoloji kullanımının varlığını garantilemeye yetmediği görülmüştür. Ayrıca, katılımcıların çoğunun mevcut teknolojileri dahi yoğun bir şekilde kullanmadığı gözlemlenmiştir.

Anahtar Kelimeler: Öğretmenlerin BİT kullanımı, Çok Düzeyli Ekolojik Sistem Perspektifi, Eğitime Teknoloji Entegrasyonu, Güney Kore, Finlandiya

To my family, Turkish educators and Headmaster Atatürk

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LIST OF ABBREVIATIONS

ABBREVIATIONS

FATIH: Movement of Enhancing Opportunities and Improving Technology

ICT: Information and Communication Technologies

IT: Information Technology

KERIS: Korea Education and Research Information Service

MEST: Ministry of Education, Science & Technology

MoNE: Ministry of National Education

MPOE: Metropolitan and Provincial Offices of Education

YEGITEK: Directorate General of Innovation and Educational Technologies

PSA: Parents-School Associations

CHAPTER 1

INTRODUCTION

This section provides a framework for the research by presenting the background of the study, a statement of the problems, the purpose of the study, research questions, the significance of the study, and definitions of the terms relevant to the study.

1.1. Introduction

The potential that Information and Communication Technology (ICT) has regarding the innovation in education is now highly valued worldwide and marked as a top priority (European Commission, 2015, 2018; Eurydice, 2011; OECD, 2010; Rodrigues & Biagi, 2017). Although ICTs are valued and invested in up to a great extent by many countries for many years so far, there is still so much to do in order to keep up with the current available opportunities and fund of knowledge regarding the educational technology use, which creates a knowledge gap. Trucano (2005) investigates this knowledge gap under 10 themes in order to propose a knowledge map based on existing literature and research: Impact of ICTs on learning and achievement, monitoring and evaluation, equity issues, costs, current projects and practices, specific ICT tools, teaching and ICTs, content and curriculum, policy issues, and school-level issues. The findings of this study are named under four key topics: Impact, Costs, Current Implementation and Planning. Based on the findings of Trucano's study, it is observed that the ICTs are mostly used in countries that are underdeveloped or developing as a complementary tool to available teaching and learning practices while much of the grounding for ICT use in education takes making a comprehensive difference in teaching and learning approach in practice as the focal point. Although the effect of the ICTs on the student success still remains debatable, it can be said that a consensus is formed around the remark that ICT use is rewarding while encouraging and enabling educational reforms, acting as a motivator to enhance the efficiency of the practices covered in education systems.

Although Trucano (2005) explored this gap some time ago, his results and arguments are still valid. Technologies and their use investigated in Trucano's (2005) study have changed over time, but the purpose of technology use remains unchanged not only in developing countries such as Turkey (Kurt, Kuzu, Dursun, Güllüpınar & Gültekin, 2013; Pamuk, Çakır, Ergun, Yılmaz & Ayas, 2013) but also in developed countries such as South Korea (hereafter S. Korea/n) and Turkey (Baek, Jong & Kim, 2008; Shin, 2015). The effects of the use of technology on student achievement are currently being investigated and discussed: There are still contradictory findings about positive impacts of ICT use on students' learning and achievement. While a number of the studies indicate that the use of computer technology at school can improve students' learning outcomes (Ayieko, Gokbel & Nelson, 2017; Demir & Kiliç, 2009; Lei & Zhao, 2007; Zhang & Liu, 2016), some of the other research provide opposing results claiming that there is a negative relation between computer use and performance of the student (Carter, Greenberg & Walker, 2017; Stakkestad & Fladvad Størdal, 2017). These incompatible findings may be resulting because the differences between the ICT backgrounds and process implementations of the different countries seem to have a strong effect on the determination of the relationship between ICT use and learning achievement (Ayieko et al., 2017; Song & Kang 2012). Therefore, it is recommended that further research shall be conducted by taking into account the determinants such as the nature of the computer use activities (Ayieko et al., 2017), technology use methods (Skryabin, Zhang, Liu & Zhang, 2015), the purpose of ICT use (Gumus & Atalmis, 2011) since all these factors have an impact on student achievement. According to the study of Ponzo (2011), the frequency of computer usage, the way of using it and the context that the computer use happens are the real determinants on the performance of student rather than the computer use itself.

According to the report of the Organization for Economic Co-operation and Development (OECD), it was revealed that the success of students in schools where more technology was used did not increase but decreased on the contrary. According to research results, schools that use computers frequently have the worst results in international tests (OECD, 2015). Schools that use the computer 1 or 2 times a week receive relatively better results than those who frequently use it. In schools that invest a lot in technology, it is noted that "not a significant development is observed" in courses such as literacy, mathematics or science. Moreover, the OECD (2015) report points out that very little technology is used in Asian education system, which is the most successful in international tests. It is stated that the success rate is much higher in education systems with less computer use such as S. Korea and China. Another interesting finding is that all of the high-performing countries / economies in PISA namely Finland, Japan, S. Korea, Poland and Chinese Taipei, revealed to be the ones using computer with the least frequency in mathematics classes. Furthermore, it is stated that although teachers in Shanghai-China prefers to introduce many tasks to pupils via computers very often, the courses seemed to be designed in a more teacher centered way leaving students less space to perform the tasks on their own. Therefore, the country ranks the lowest place among the other countries and economies regarding the criteria measuring whether the students do the tasks on their own by using technology. The number of students per computer increased in Turkey and 6 other countries from 2009 to 2012 at the school level but decreased in schools of 17 other countries including Finland and S. Korea. These data indicated that the opportunity of access to computers decreased in time in Turkey, while it increased in Finland and S. Korea. In addition, the large part of the students does not utilize Internet on a daily base in the schools of the following countries: Germany, Italy, Japan, Jordan, S. Korea, Macao-China, Poland, Shanghai-China, Singapore, Turkey and Uruguay. It is revealed that the frequent and high use of computer in schools does not necessarily ensure academic success when we observe that the computer and internet use in the schools of high performing countries is not actually very frequent or high.. Interestingly, although access to computers is reduced and there is no high use of internet in Turkey, the success of students is low. It appears to be logical to come up with the opinion that the quality of technology use is more important than the frequency of use. In this case, to investigate the purpose of technology use and the context that technology is used in can help to analyze and understand the differences between Turkey and high performing countries in terms of technology use and the contribution that it makes to the education and it may also help us understand why Turkey is not placed among high ranking countries accordingly.

It is specified in the previous studies that integration of ICT in general (e.g. Mackey & Mills, 2002; Ng, Miao & Lee, 2010) and the adoption of technology use by the teachers (Chen, 2010; Tondeur, Valcke & van Braak, 2008a) are complicated concepts. Therefore, in order to understand teachers' use of technology in the classroom, it is necessary to approach this process with a comprehensive perspective considering many variables. Because the nature of the teaching context that is engaged with a multilevel ecological hierarchy, which consists of the government agencies, societal institutions, local community organizations, and the school bureaucracy, is important (Porras- Hernández & Salinas-Amescua, 2013; Zhao & Frank, 2003), multi-level frameworks incorporating country, school and individual level factors that influence educational ICT use are taken into consideration in order to explain effective technology use in the classroom, which contributes students' learning (Zhang & Liu, 2016). Among these factors, policy-related issues are frequently studied topics in the literature (eg. Lim, 2007; Tondeur, Keer, van Braak & Valcke, 2008; Wong & Li, 2008), since educational policies form and reform the educational systems. Even though new ICT policies are seen as where the change starts for ICT integration, studies to provide assistance in establishing links between the achievement of educational goals with the potential use of ICT for decision-makers and practitioners didn't really generate remarkable solutions or answers for the problems regarding policy formulation (Ng et al., 2010).

The extent how much a country puts emphasis on ICT policy development differs. Some countries adopt a direct approach and start to train teachers regarding ICT use without establishing any ICT related educational policy first. Others value policy establishment prior to any direct implementation of ICT use in order to set a clear framework to guide in the process. However, there are also some other issues to be closely considered while ICT use in education is the matter in question such as the establishment of a proper environment and making restrictive regulations such as required censorship applications and legal framework of internet use. A lot of countries have developed many different policies and strategies in order to accomplish ICT integration in education. When constructing policies regarding ICT integration, the following points have to be considered: (1) ICT's role in the Policy of National Education, (2) the available education system along with the existing ICT infrastructure, and (3) the economic and sociocultural structure (World Bank, 2005). When considered in terms of sustainability and long-term practice of ICT use, the available nationwide infrastructure is of the essence in order to ensure high quality of connectivity and accessibility.

As stated in the policy note published by World Bank (2005) regarding ICT in schools, the educational policy should be established in consideration of the followings in order to accomplish ICT integration into education properly: (1) Existence of an education system that is both open and responsive, (2) ICT policy in education should be parallel to the other Educational Policies and Initiatives regarding the vision it adopts, (3) ICT in Education Policy should be driven by a vision that targets a change in the learning paradigm, (4) Adoption of an holistic approach regarding the ICT in education, (5) planning the ICT policies in line with the development strategies in education, (6) Giving importance to establishing awareness regarding ICT use by identifying and documenting the examples of successful ICT use in education worldwide in order to create awareness accordingly. Above mentioned suggestions are derived from the experiences and best practices of many countries from North America, Europe, Asia and Latin America in order to help the countries that are new to ICT practices in education. Therefore, they should be considered in the process of ICT policy development in Turkey too.

Educational policies of any nation are the key to global security, sustainability, survival (Olssen, Codd & O'Neill, 2004) as well as socio-cultural and economic development especially in the 21st century. However, teachers and schools are the ones who shape and structure the learning environments based on curriculums which are formed based on policies. For example, teachers and schools can rely on national curricula covering educational technology use to design and organize these learning environments (Aesaert, Vanderlinde, Tondeur & Braak, 2013). In this sense, considering the top-down structure of implementations, policies take place at the top level, while teachers and schools can be placed at the down level, because the written policies are a sort of intervention to the practices, which give priority to the reality of the policy makers (Ball, 1994). It can be hard for the policy makers to foresee the way the policy guidelines would be interpreted in different cases (Ball, 1994). Thus, employing a bottom-up perception is vital when it comes to the implementation process since the means of implementation are likely to be malpracticed at the lowest level of the hierarchy. Into this study, by including S. Korea, whose form of government and policies are similar with Turkey, and to include Finland, which has a totally different form of government and policy implementation from Turkey, may help us understand how the applied ICT policies and the related perceptions employed affects the ICT use in practice in terms of teachers and the principals.

Cohen, Mccabe, Michelli & Pickeral (2009) draw attention to an obvious gap between school climate and policies, practices for school improvement, and the efforts of teacher educators as it is understood from the findings of his study about school climate. School climate is a term indicating the quality and character of school life and the school life is shaped by the experiences of the people in the school environment (Thapa, Cohen, Guffey & Higgins-D'Alessandro, 2013). This term also includes norms, goals, values, interpersonal relationships, teaching and learning practices, and organizational structures. School climate characterizes the organization at the school building and classroom level (Tableman & Herron, 2004). In this context, classroom environment can be considered as the smallest part of school environment that reflects the school climate. Therefore, it is not surprising that the school-level factors including school climate, ICT leadership, collaboration, powerful school policies, technical and pedagogical support can have a positive impact on teachers' effective technology use in the classroom (Aydın, Gürol & Vanderlinde, 2016; Eickelmann, 2011; Inan & Lowther; 2010; Vanderlinde & van Braak, 2010).

The teacher plays a crucial role in modelling and managing the learning environment, including making decisions about whether and how to incorporate ICTs into teaching and learning process (Smeets et al, 1999). In a bottom-up manner, to understand practices in ICT use in education, analyzing classroom environment while keeping the teachers at the focus can provide important clues about the practices without neglecting other direct or indirect influences in the education system. For example, the use of ICT in the classroom gets affected by the teachers in terms of their professional development. Findings support the idea that creating opportunities of professional development for teachers help them become more confident and develop a supportive approach in educational practices, which results with a boosting effect on ICT use in teaching and learning processes (European Schoolnet, 2013). Even when they have access to technology and they already adopt a positive approach against technology use, teachers tend to find ICT use in education difficult and mostly feel the need for being technically and pedagogically supported. Simply providing the hardware and the software will not be sufficient to support teachers and students in using ICT within educational settings (Earle, 2002). Thus, the level of infrastructure that a country has and the number of computers per students at the school do not always show that the technology is incorporated in classrooms up to a great extent and the course objectives are fulfilled. For instance, S. Korea has limited use of computers in education (OECD, 2015), despite the fact that S. Korea is one of the leading countries in access to advanced technologies and the internet (KISA, 2018).

Additionally, with respect to Trucano's (2005) study, students are more sophisticated in their use of technology than teachers. In OECD countries, there appears to be a disconnection between student knowledge and usage of ICTs and the knowledge and ICT skills of teacher. This suggests that inexperience and skill deficiencies of teachers may often be an important factor inhibiting the effectiveness of ICT use in education by the students. From this point of view, understanding of teachers' experiences related to practices of educational ICT use in their own context might shed light on creating more effective policies and curriculum, and also it can help to improve performance in teaching and learning processes. Thus, this study focuses on teachers' experiences in ICT use in education considering the effects of their environment (e.g. classroom setting, leaders, students, policies) and their background (in-service trainings received, university education) without ignoring policies and school-related conditions since teachers' activities are limited depending on the curriculum area, the experience, background knowledge and needs of the learners in any particular context. The purpose of reviewing the technology use by making a comparison among countries is to explore the teachers' ICT use, a contemporary phenomenon, without separating it from its parts since it is not possible to make a review apart from its context (Yin, 2003).

1.2. Background to the Study

Educational innovations in purpose of contributing to obtain learning outcomes of high quality can be divided into two main categories namely "homegrown" (generated through the system itself) and "imported" (generated through external effect) regarding the education systems. Information technology revolution and social media can be given as the examples of imported innovations emerging due to revolutions, trends, or new ideas. Innovations may also be based on superior international theories and practices. Another case that leads to innovation is the national reforms. Just like in the examples of S. Korea and Finland, governments can make a national reform and totally revise the system or society can also trigger the innovations by embarking on new roads (Serdyukov, 2017).

Policies and practices employed regarding the technology integration differ greatly among various countries at the national level (Başak & Ayvacı, 2017; Özmen, 2017). Educational policies can be defined as centralized and shaped in bureaucracy in some countries, while the policies of others can be characterized as realistic and practical. Difference can also be spotted among the way that technology integration is defined in the curriculums. The main point is to incorporate ICT use and develop the related skills in some curriculums whereas obtaining 21st century skills and the problem solving approach becomes prominent in others. In addition, real life examples of instructional programs can help us infer the difference. ICT integration is encouraged in many areas of learning in some countries, but it remains limited to the lines drawn in curriculums for some others. Despite the fact that the education policies of every country includes the technology integration, majority of them do not have an established institution specialized on the implementation of technology integration in education (Özmen, 2017). The countries' different dynamics that are educational, social and cultural are the reason for variations. Therefore, every country has created its own specific policies and curriculums regarding the technology integration.

Numerous studies have been published so far discussing the barriers and enablers of integrating technology, the estimated amount of investment that is needed in order to fully support educational technology, and, of course, the effectiveness of technology in the classroom (Delgado, Wardlow , McKnight & O'Malley, 2015). There are many international and domestic studies which investigate the uses of ICTs in various ways to benefit education (Benini, 2014; Cunska & Savicka, 2012; Flecknoe, 2002; Sangrà & González-Sanmamed, 2010; Usluel, Mumcu, & Demiraslan; 2007), the variables influencing teachers' ICT use (Aslan & Zhu, 2018; Eickelmann, 2011; Ertmer, 2005; Gök & Yıldırım, 2015; Inan & Lowther, 2010; Tondeur et al., 2008a; Vanderlinde & van Braak; 2010), and currently available experiences with technology integration practices in education (Altın & Kalelioğlu, 2015; Kurt et al., 2013; Pamuk et al., 2013; Tondeur, Cooper & Newhouse, 2010, Uluyol, 2013; Yıldırım, 2007). In addition to these, there are also statistical databases and systematically published reports which give a measurement of key ICT indicators (e.g. UNESCO, MoNE, Eurydice, OECD, TALIS, The World Bank, and European Schoolnet). Since such databases include many countries' data and the existence of an extensive body of knowledge regarding the ICT integration into education, the comparison of countries' success in terms of the established indicators is inevitable.

The researchers in Turkey, do not refrain from making these comparative studies among Turkey and more successful or pioneer countries focusing on the comparison of ICT policies (Ağır, 2010; Goktas & Yildirim, 2003), the integration process of ICT (Başak & Ayvacı, 2017), education systems (Balbay & Kilis, 2018; Boydak & Yaraş, 2017), ICT in the curriculum (Goktas & Yildirim, 2003; Özmen, 2017), teacher education (Aras & Sözen; 2012; Altıntaş & Yeşiltepe, 2016; Balbay & Kilis, 2018; Cirit Gül, 2016; Göçen Kabaran & Görgen, 2016), and state of the teaching profession (Aslan, 2015). By making comparisons with countries such as S. Korea, Finland, Germany, Singapore, the United States, suggestions from different point of views have been made on how to use technology's potential in education in the most effective way. Interestingly, similar results were obtained when Turkey is compared with any of these countries considered successful regarding categories such as policy establishment and implementation, project management, research and development, teacher training, technology procurement and school management. But still the answers and solutions regarding the problems set forth in the results of these studies do not seem to have helped to overcome the obstacles encountered in the process of technology integration in Turkey. Because both qualitative and quantitative studies, whether comparative study or not, draw attention to many deficiencies and halting points related to the process (Aydın et al., 2016; Çelik, Karakuş, Kurşun, Göktaş & Özben, 2017; Ekşi & Yeşilyurt, 2018; Gökmen, Duman & Akgün, 2018). While the problems are already listed and highlighted in many documents, solution suggestions are only given in an iterative and general manner. As much as the problems are pointed out, the solutions remain that much ignored.

Currently, while access to and use of technology inside and outside the school is ensured in some way, the biggest concern is probably about how to make better use of technology instead of concerning about whether the technology will be employed or not (Ertmer, 1999; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur & Sendurur, 2012; Lowther, Inan, Strahl & Ross, 2008). For this reason, finding the ways to overcome problems encountered in the process of technology integration by making use of the studied international best practices and experiences, can be an attempt to ensure the transfer of already produced solutions into the context of Turkey rather than seeking for superficial solutions. The purpose of this study is to develop a better understanding of the teachers' ICT use in the classroom environment with a comprehensive approach that is teacher-centered in many aspects, where the S. Korea, Finland and Turkey are the observed countries. Therefore, it will be possible to make recommendations that are solution oriented and more accurate. Multiple case studies enable the clear observation of processes and outcomes in many cases, therefore they let us understand the local conditions and help us infer more accurate explanations (Miles & Huberman, 1994).

While choosing the countries to be compared in the comparative studies that will include three countries, the criteria might be the similarities and differences regarding culture, economic structure, form of government, development level, the country's place in the world economy, political system, political ideology, historical background, social conditions, and sociopolitical transition (Fairbrother, 2005). When Turkish, Finnish and S. Korean educational systems are described and compared in the literature review chapter, it is seen that the educational system in Finland is different than the educational systems in S. Korea and Turkey in terms of centralization-decentralization concept. Although Turkish educational system shows some similarities with the S. Korean educational system regarding the centralization concept, Turkey still has a lower ranking than both S. Korea and Finland which are the most successful countries among OECD member countries in categories such as reading, mathematics, science and etc. Turkey is unable to achieve the desired level of success in OECD evaluations between years 2003 to 2015 (OECD, 2019c; 2019d; 2019e). So, it is necessary to note that the justification for the choice of these three countries is mainly based on the differences rather than the similarities: differences in governance of education and political system, because they shape practices in school level. Thus, conducting a comparative study can provide insights and exchange of different practices and experiences in different structural forms and systems in order to improve the practices in selected countries. Moreover, this study can provide an initial step to review the policies and curriculum at the school/classroom level regarding implementation of ICT use with a critical approach.

According to IETE report (Bakia, Murphy, Anderson & Trinidad, 2011), existing international collections are a primary source of information on the extent of ICT use in education across a variety of countries. However, the information collected to date has been mostly limited to indicators related to access to ICT and types of its use. There has been little, or no effort made to link ICT investments to better student outcomes. The number of countries represented in these collections is limited. In similar, cross-case studies are based on quantitative results rather than qualitative explanations in order to describe the current situation and present the overall picture. Thus, this study maybe a contribution to the Turkish literature involving the ICT integration in education providing a deep and critical look at the educational use of ICT practices in the country with its qualitative description.

In process of technology integration, there is no doubt that the educational ICT use is one of the most important instruments in creating the knowledge society in Finland (Kozma, 2008) and S. Korea (KERIS, 2015). A significant consequence of this situation has been that it changes and shapes their national cultures (Serdyukov, 2017). This provides a remarkable example for other nations, including ours. This is in fact one of the underlying causes of selecting Finland and S. Korea as the countries to compare with Turkey in this study. Other reasons can be summarized as follows: (1) The fact that both countries are listed at the top of PISA student performance results (OECD, 2015), (2) the fact that they consider ICT as a tool in forming the information society and develop its educational and economic policies accordingly (KERIS, 2015; Kozma, 2008), (3) the fact that they set an example with their technological reforms and the changes made in curriculums to ensure the acquisition of 21st century ICT skills (Kim & Eom, 2017; Voogt, J. & Roblin, 2012; Wang, Lavonen & Tirri, 2018), (4) the fact that S. Korea shows resemblance to Turkey in many aspects such as education system, culture and governance of the public institutions (Başak & Ayvacı, 2017) (5) the fact that even Finland as one of the EU countries do not have a lot of common features and similarities with Turkey, it can be regarded as the more ideal case (eg. European Commission, 2017).

S. Korea and Finland are countries considered as successful in education and the efforts they make for the technology integration are remarked internationally. Therefore, they are regarded as two countries that can constitute an example for Turkey in different aspects. This study, which basically explores the teachers' use of technology in classroom and the aspects that affect them in different contexts, is an attempt to establish a reasonably comprehensive picture of the barriers and enablers to technology integration for teachers from various subject, ICT teachers and advisors, principals from a multi-level ecological perspective. The use of technology in the classroom, which is a paradigm that does not allow for a clear separation of the phenomenon and context, has led to the necessity of examining the differences and similarities in and between cases as a multi-case study (Yin, 2003).

1.3. Problem Statement

First of all, although there are comparative studies comparing Turkey and a variety of pioneer countries regarding their effective technology integration processes and successful education, these studies do not really reflect the perspectives of the practitioners of the process, which may provide in-depth understanding of their experiences. These studies are mostly conducted by utilizing available documents and literature analysis without reflecting the understanding of countries' unique context and culture aspects specifically. Therefore, there is a need for going beyond simply identifying or correlating factors influencing teachers' ICT use in the classroom in order to gain a comprehensive understanding about teacher's ICT use. In this sense, interactions, activities, processes, and practices require more attention since these studies mostly fail to make recommendations to establish a certain formula for the best ICT practices to be implemented and integrated regarding the education system. Since each country has a different education system and each one of them may require tailored solutions specific to the case, this kind of failure could be expected.

Secondly, very few studies have been encountered in terms of producing solutions against all the problems identified while exploring technology integration process. The main reason of this situation is that similar studies did not examine the complex phenomenon in-depth from a multi-level ecological approach. It is unclear that how the similar documents, guidelines and projects compared are implemented in practice and how the continuity of applications within the organization is ensured in their own context. That is why this study and studies alike are very valuable to provide the researchers with the ideas.

To summarize, a study that analyses the teacher's technology use in Turkey with an ecological perspective in many aspects was not encountered within the literature. Cross-country comparison studies do not go beyond comparing documents, policies or teacher trainings. For this reason, from the ecological perspective, it is aimed to give an idea about macro, meso and micro layers with the help of this study which includes many aspects affecting the use of technology. Thus, problems in the use of ICT can be better understood. It is thought that revealing the problems without isolating them from the context, will enable the production of the solutions more effectively. At this point, by making comparisons with other countries regarding similarities and differences in terms of the aspects affecting the teachers' use of ICT, different perspectives can be developed in order to find solutions to ICT related problems in Turkey.

1.4. Multi-level Ecological Framework as a Framework for this Study

Although, the conceptual framework of the study is explained with its major components in detail at the next chapter, a brief overview of the framework is presented here. Multi-level ecological perspective suggested by Zhao and Frank's (2003) is adopted in this study in order to explain the relationship between individuals and the environment, which has a dynamic characteristic. Furthermore, system view of education of Banathy's (1992) is also considered throughout the study in purpose of presenting the understanding about education system. With the understanding of ICT use at the focus of this study, it should be kept in mind that ICT use gets affected by many variables when it is analysed through a multi-level perspective.

Multi-level ecological perspective is defined to comprehend ICT use in education based on an extensive number of factors affecting the ICT use by isolating these factors from each other or from the system that they interact with (Zhao & Frank, 2003). The term "multi-level" refers to the multiple levels composing the hierarchy of the education. In this study, there exist 3 levels in total: Macro, meso and micro. The ICT use of teachers is affected by the factors covered at each level in terms of individual, social, environmental and policy related aspects.

- **Macro Level:** Refers to regional and national entities. At this highest level, ICT integration is affected by sociocultural norms, policies and economic forces.
- **Meso Level:** Refers to the school and local community. Meso level is defined as the mid level where the practices of ICT use in education get influenced by the local institutions such as schools, organizations and universities.

- **Micro Level:** Refers to the classroom setting. Students, teachers, their perceptions and attributes are considered effective on ICT use and they are marked as the indicators at this level along with the teaching practices as a whole.

1.5. Purpose of the Study

The purpose of this study is to investigate differences and similarities in the aspects affecting ICT integration in classroom practices within the contexts of Turkish, Finnish and S. Korean education systems from a multi-level ecological perspective in order to present a comprehensive picture of barriers and enablers of ICT use of teachers. While the focus is at the classroom level, the problem statement is not limited to it but the school and national levels are considered too. The study is also an attempt to explain the differences and similarities among Turkey, Finland and S. Korea at three levels, namely, macro, meso and micro, focusing on the distinctive features of ICT use in education within a multidimensional frame including their political, socio-cultural, and economic features. Teachers, principals and ICT advisors as practitioners of ICT policies are the main focus of the study in order to point out the possible problems encountered in the process and to identify solutions to these problems.

The study aims to make a comparison amongst Turkey, Finland and S. Korea, regarding ICT use experiences of teachers in classroom at K-12 level in three different educational contexts in order to provide thick and in-depth data and make the comparison and the discussion of these data to present the reasons of differences and similarities in their own context. Examination of these data might be important in order to help (a) to provide better recognition of countries, (b) to reveal the similarities and differences, (c) to make recommendations for Turkey, and also (d) to give a direction for the future in terms of policies and decisions to be made. The main aim of the recommendations is to help to understand how Turkey can achieve the desired level of success in its own context. A descriptive and comparative approach to ICT use is adopted and a critical examination of the three countries' potentialities and limitations is performed since multiple case comparative studies pave the way for a more extensive exploration of the aimed research questions (Eisenhardt & Graebner, 2007).

1.6. Research Questions

The research question that formed a basis for this study is:

1) What are the differences and similarities amongst Turkish, Finnish and S. Korean education systems in the aspects affecting teachers' ICT use in the classroom from a multi-level ecological perspective?
    a. At macro level? (Regional and national entities)
    b. At meso level? (The school and local community)
    c. At micro level? (The classroom setting)

1.7. Significance of the Study

This study aims at providing a clear and a holistic perspective to understand teachers' use of ICT at classroom level in Turkish, Finnish and S. Korean cases of education system. In this way, the study can open up some frames for the ICT integration process in education practically through qualitative inquiry by focusing on teachers' ICT use. The reason of conducting a comparative research is to employ a multi-frame approach, which reflects the distinctions and similarities as well as strengths and weaknesses of each experience of ICT use and provide some explanations or solutions to possible or current problems accordingly. It is highly agreed upon in comparative education research that although there exist many diversities among the countries observed, many commonalities can be identified too. Among these commonalities and differences, generic insights can be obtained, stimulated and fostered. Moreover, it is also well-known that studying other countries' systems of education provides better understanding and studying of our own system (Bray, Adamson & Mason, 2007).

Similarly, Türkoğlu (1985) also agreed that comparative studies help researchers detect and reveal the systematic similarities and differences in education worldwide, which enables to derive lessons from the data gathered and to make constructive recommendations accordingly (cited in Oğuz & Tunca, 2008). For this reason, the current study can help to get an insight of three countries’ educational ICT use activities and processes at classroom level and can offer some new approaches for other countries’ ICT use. It’s nothing new that comparing Turkey with leading countries and trying to find solutions to the problems by benefiting from the best practices of those countries. However, it is unique that comparing the ICT uses of teachers from Turkey, Finland and S. Korea from a wide perspective just like in this study.

Of course, many studies have been conducted so far in many countries about teachers' use of ICT, the ICT integration process, factors affecting this process, and similar research topics. In addition to these, there are a lot of related databases and publications and many institutions that statistically measure student achievement, accessibility of technology, computer and internet usage in education worldwide. The characteristic of this study that makes it distinct from the other studies is that it is based on the data collected through relatively long term visits, interviews made in place, field note taking and live experience. Observation of the education systems, ICT policies, and emphasis made on ICT use, school culture and the attributes of the teachers enables to make case analysis, put pieces together and see the big picture here. “Making strange patterns familiar and familiar patterns strange” (Bray et al., 2007, p. 377) is one of the underlying aims of this study when it is considered that the number of studies applying a comparative perspective including Turkey, Finland and S. Korea seem quite scarce, especially in the field of ICT use in education. Thus, this study can provide a mirror to reflect the case in Turkey, Finland and S. Korea to gain more knowledge about implementations of ICT policies individually and to identify the context in which ICTs are used, which contribute to compare and contrast the ICT use practices in different contexts.

The contribution of the study to Turkish literature in brief; (1) establishing the factors that affect teachers' ICT use holistically from a multi-level ecological perspective (2) to provide more accurate, diverse and tailored recommendations for the Turkish case by making comparison for the similarities and differences among 3 countries (3) to provide comprehensive understanding of teachers' ICT use by making more accurate interpretations based on long term visit experience (4 months), observations and field notes.

The contribution of the study to international literature in brief; (1) To establish the current situation in different countries again by reviewing the elements affecting the ICT use of teachers (2) to make a contribution to the relevant literature of the mentioned countries by taking the results of the interviews and observations obtained from those countries as the basis (3) to provide further information obtained by a single researcher which studies the cases in 3 different countries as the main instrument of data collection and analysis.

1.8. Definitions of Terms

Information and Communication Technologies (ICT): Toomey (2001) defined ICT as a tool to access collect, manipulate or present information. Hardware such as computers and alike devices, software such as applications, programmes and the connection types such as networking or Internet access are defined inclusive within the term "ICT" in this study.

ICT Integration: Within the current study, ICT integration in education is defined as the effective and efficient use of ICT in all parts of education by the involved parties. For the ICT integration to be meaningful, the time, the reason and the ways of the technology use must be determined in order to enable learning. Planning the practices and selecting the application tools that are optimal are required along with having the relevant knowledge and skills in order to ensure the implementation and evaluate the effectiveness of the process (Newby, Stepich, Lehman, & Russell, 2006).

ICT Competencies: ICT competencies are defines as the knowledge, skills, abilities and the understanding required for the effective and efficient use of ICTs serving its purpose

School Administrators: Principals and assistant principals are regarded as the school administrators within the study.

ICT Advisor: ICT advisors are defined as the people providing advices for the proper ICT use in purpose of the enhancement of teaching and learning processes at schools. As mentioned in the current study, these advisors are not required to be teachers, but they can be IT engineers and etc.

ICT Teacher: Computer Teachers and Computer Coordinators at schools are regarded as ICT teachers. The mission of the computer teachers are given as teaching the subjects such as information technology, hardware, software, computer use, the use of office application programs like word processor, spreadsheet, and presentation tools (Becker, 2001). It is observed that the computer teachers are mostly graduates of Computer Education and Instructional Technology department in general, Computer Coordinators are mostly composed of teachers of different subjects but of teachers that received in-service trainings provided by MoNE. Still, computer coordinators were regarded as computer teachers in this study.

Effectiveness: It is the degree to which something is successful in fulfilling the desired purpose.

Teacher Training School: Teacher training schools, which are also named as Training Schools or Practice Schools, are referred as Normaalikoulu (Normal schools) in Finland. These schools are also linked to the Faculty of Education as they collaborate with the universities in terms of pedagogical practices and research. Teacher training schools include basic education (grades 1–9) along with high school education in general. The responsibilities of the teacher training schools consist of teaching, offering teacher trainings, training supervision, providing opportunities of experiment making, research and further education. Teachers employed in these schools are regarded as the employees of the university. The schools keep up with the National Curriculum and benefit from the same independence owned by the other schools in the mean time.

Korea Education and Research Information Service (KERIS): KERIS is a national governmental institution in S. Korea. It functions to develop human resources through e-Learning, ensure public trust in education, and establish a basis for a society of knowledge and information with the help of digitalization activities. KERIS mainly focuses on advancing the national education in order to make it competitive by promoting ICT use both in education and academic research.

YEGITEK: YEGITEK is general directorate institution at MoNE, which is responsible of coping with and managing all the issues regarding educational ICTs.

FATIH Project: FATIH Project, or Movement to Increase Opportunities and Technology, is a state-backed project. Providing the best education possible, the highest quality educational content and equal opportunities for every student is the main objective. FATIH project is composed of five main components. These components are mentioned as follows: (1) To establish hardware and software infrastructure, (2) preparation and management of educational e-content, (3) effective use of information technology (IT) in the curriculum, (4) teachers' in-service trainings, (5) conscious, reliable, manageable and quantifiable IT use.

CHAPTER 2

LITERATURE REVIEW

In this chapter, first of all, the conceptual framework of the study is explained with its major components to draw a map that sets the direction of the research. A multi-level ecological perspective is adopted to examine technology integration through three levels (macro, meso, and micro) in three different countries (Finland, S. Korea, and Turkey). While describing the framework and its levels, the relevant literature regarding factors affecting teachers' use of technology and technology integration process are also included under these levels. Rather than the findings regarding the countries studied, the research literature review highlights the issues of ICT integration process in education along with the variables that are effective on the ICT use of teachers which brings common topics forward to discuss on an international level.

Additionally, a descriptive background information related to the cases in Turkey, Finland and S. Korea are presented under four categories: Contextual factors, enrollment and attainment, achievement and students, ICT status and use. After the provision of this background information, the cases are explained under seven topics as follows: Educational norms of the countries, educational systems, learning environments, teachers in education system, and assessment strategies of educational outcomes, finance of education systems and educational context of ICTs. When the literature review and the analyzed comparative studies are considered, a gap in the literature is spotted. The comparison of the countries regarding ICT integration processes are mostly made only based on document analysis rather than adopting a holistic approach from a multi-level ecological perspective. Therefore, finally this gap will be explained and tried to be filled.

2.1. The Conceptual Framework of the Study

A conceptual framework determines the boundaries of the study as well as guiding the direction of the investigation through forming the interview questions and analysis of the data collected. The conceptual framework as a meaningful representation of the aspects that may affect the educational ICT use in the classroom is presented from a "*multi-level ecological point of view*" (Zhao & Frank, 2003). Ecological perspective is qualified as a useful approach in order to identify the technology use having a dynamic nature at the school level in a holistic way by the researchers (Bruce & Hogan, 1998; Zhao & Frank, 2003). According to Zhao and Frank (2003), the school and its classrooms can be figured as an ecosystem that consists of various species adopting various characteristics and roles and all the components of this ecosystem affects each other creating a dynamic relationship structure that is continuously changing.

Education systems are "open, dynamic and complex social systems" (Banathy, 1992, p.17). They are "sensitive to the external environment, including social, political, and economic conditions" (Brandt, 1998, p.51). The opinion that the quality of a part can be mainly determined by looking at its relationship with the whole is suggested by the system view. The design of a system and its parts should be made by considering the whole system and the way it is embedded within its environment. Therefore, the opinions of Banathy (1992) regarding education systems can help to establish a guide to description and analysis of the educational context in a more comprehensive and detailed manner. Similarly, teachers' ICT use itself may not be explored insularly from a reductionist perspective, since it does take place in a learning and teaching environment as a part of an open, dynamic and complex system. Therefore, in the current study, Banathy's (1992) system view of education is taken in order to reflect the understanding of whole education system, while Zhao and Frank's (2003) multi-level ecological perspective is adopted to explain the dynamic relationship between individuals and their environments within the system. Even if explaining the use of

ICT is the main focus of our study, it should be taken into account that the ICT use is a concept that could be affected by many variables from a multi-level perspective.

Multi-level Ecological Perspective- An ecological perspective is interested in the relationship between individuals and their environments while believing in the nature of reality shaped in an interconnected and interdependent whole. The reason is that separating the parts of a whole that constitutes a reality and evaluate them as independent individual entities would result in an illusive understanding of the reality itself (Settanni, 1990). Thus, holistic examination of the phenomenon would draw attention on "interaction, activities, process and practices" rather than simple identification of factors or correlations between factors (Zhao & Frank, 2003, p.833). Accordingly, it would be a shallow attempt to explain the use of ICT by isolating it and the factors from each other or from the system.

Zhao and Frank (2003) proposed an ecological view as a powerful analytical framework for the understanding technology uses in schools due to lack of hierarchical and holistic view on the reasons of the slow technology adoption by teachers in the classroom. Additionally, they defined the teachers as "keynote species" because that the teachers play a leading role in technology integration. In other words, teachers are decision-makers who determine whether, how or what technology would be used in the classrooms (Davis, 2008; Zhao & Frank, 2003; Zhao, Lei & Frank, 2006). For this reason, teachers can be seen as key factors that regulate technology integration in the schools.

Figure 2.1 visualizes the multi-level ecological perspective. Layers of educational ecosystem are framed by national organization level, school level and classroom level. The visualization is inspired from Zhao & Frank's (2003) study which sees that "a classroom is nested within a multi-level ecological hierarchy including government agencies, societal institutions, local community organizations and the school bureaucracy" (p. 815).

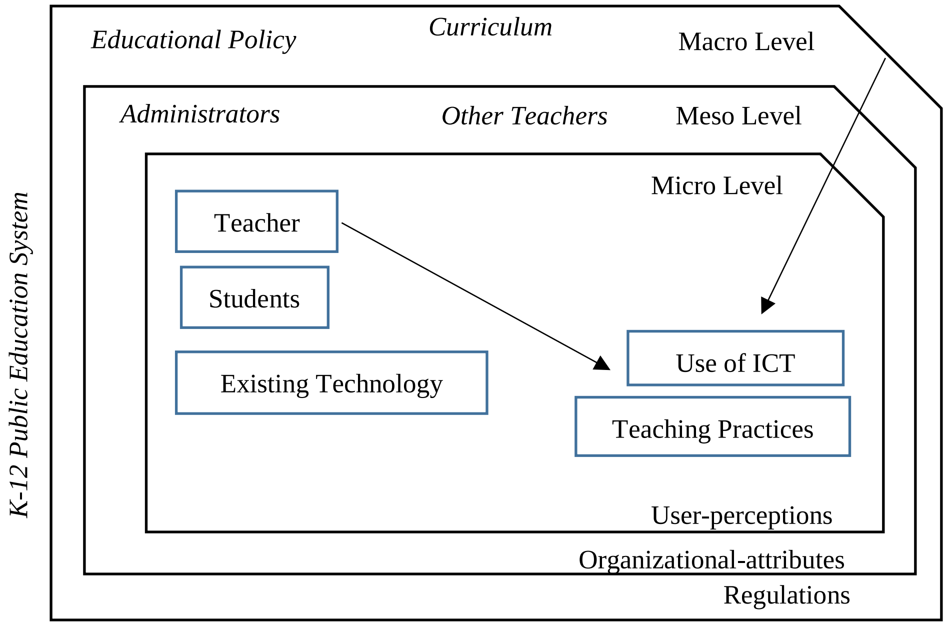


Figure 2.1. Conceptual Framework of ICT in Practice from a Multi-level Ecological Perspective (Zhao & Frank, 2003)

In the systems view of education, system-environment model as one of the models developed by Banathy (1992) to understand, describe and analyze an educational activity system also supports the idea of multi-level ecological perspective. System-environment model presents a "bird's eye" view of an educational system interacting with its own environment. The interactions and future or recent relationships that the educational system forms with its surrounding environment along with the patterns of interdependence that exist can be identified with the help of the bird's-eye-view (Joseph & Reigeluth, 2010). To a certain degree, multi-level ecological point of view and system-environment model coincide, since they consider different group of factors influencing the integration of ICT in teaching. However, when the differentiation of the levels is not performed, arguments developed regarding the context can be indistinct. In some models such as the model presented by Bronfenbrenner, which is ecological and developmental, concentric spheres are used in order to represent the context (Bronfenbrenner, 1999). Division of the context into minimum three main levels such as macro level, meso level and micro level is highly suggested by Porras-Hernández and Salinas-Amescua (2013).These levels include external conditions affecting or defining the practices of the teachers and in addition, they also consist of objects of knowledge that are to be learned and interpreted by the teachers.

2.1.1. Definition of Macro Level and Related Factors

Conditions that are social, political, technological, and economic define the macro level (Porras-Hernández & Salinas-Amescua, 2013). These conditions also include the worldwide technological developments, that happens rapidly and necessitate continuous learning, along with national and global policies which renders specifically relevant when teacher technology integration is in question. Thus, ICT related national policies, curriculum and decision-makers are the main focus at this level.

2.1.1.1. ICT related Policies and Practices in Education

As the definition of technology integration has been evolving, the change is required for the other related components in the inclusive system. That's because "a fundamental aspect of educational communications and technology is change" (Mikre, 2011; Spector, 2008, p.21) and for the successful change in the system, other aspects are also required to go through essential changes (Reigeluth, 1994). Similarly, Brown (2009) discussed that existing technologies are not in rapport with the current culture of schooling due to the fact that technologies are changing the way we think, produce, use information, interact with others, construct knowledge, form a culture, and particularly the way we learn (Punie, 2007). Thus, they suggested a change in schooling and in the perspective of policy-makers and educators by giving a deeper consideration to education also taking inside and outside of school context into account. Some studies (e.g., Crawford, 2013; Kulp, Honey & Mandinach, 2003) also revealed the importance of educational policy change in parallel to evolving technologies.

Education as a social institution is a complex dynamic system that engages a variety of stakeholders such as students, teachers, parents, administrators and policy makers. These stakeholders also affect or get affected by the change that happens in the name of getting the most benefit from pedagogical use of technology. That's because meaningful technology use or effective use of educational technology in K-12 settings is a great concern for both policy-makers and practitioners (Kulp et al., 2003). For instance, Dwyer, Ringstaff and Sandholtz (1991) pointed out that technology integration into the classroom caused a change in instructional components such as the role of students and teachers, learning environment, educational resources and learning activities in order to ensure a meaningful learning experience. Punie (2007) emphasized that the change is necessary to develop digital competences and ICT skills while maintaining current levels of education and learning in the knowledge-based society that is empowered by ICTs. Furthermore, he also added that in order to achieve the required transformation, a holistic vision should be employed in Europe accordingly. Thus, he developed a new vision about learning, namely "learning spaces", which is an ICT-driven educational concept. In this new vision, learners are seen as not only consumers but also the co-producers of the knowledge while learning is considered as a social process. Furthermore, he discussed that to accomplish the various promises of ICT in education and to reach the goals of ICT-enabled learning spaces, there is a need for "investment, resources, innovation, further research, multi-stakeholder system, involvement, trial-and-error and many more social and institutional changes" (p. 195).

Even if there are extensive changes in national education systems, international governments make an ICT investment in education with the purpose of improving the standards of education and preparing young people for 21th century knowledge base economy (Austin & Hunter 2013). Therefore, examining the nature of ICT policy implementation to define the successful integration of ICT in the classroom (Lim, 2007; Tondeur, van Braak & Valck, 2007) is a common concern of researchers. The project of International Association of the Evaluation of Educational Achievement

(IEA), namely Second Information Technology in Education Study Module 2 (SITES-M2 2006), that included 174 case studies of new pedagogical practices in ICT-supported classrooms from 28 countries, was a cross-case study and the data were collected from primary and secondary schools by using qualitative and quantitative methods to explore the relationship between innovative pedagogical paradigm and related contextual factors at the classroom, school and system levels from an ecological perspective (Law, Pelgrum, & Plomp, 2008). The study found that there was an obvious connection between innovative practices of the teachers using ICT and supportive national ICT polices and plans (Jones, 2003). Moreover, the study pointed out that the sustainability of ICT-based innovations was based on support supplied from internal sources such as administrators, other teachers as well as from external sources such as funding, supportive plans and policies (Owston, 2007). Therefore, learning and teaching activities may be directly influenced by ICT policies as well as being indirectly influenced through curriculum and resource support, access to ICT devices and connectivity (Wong & Li, 2008).

Strategic policies can present a guideline, set of goals and shared vision to designate how the introduction of ICT should affect education and determine how stakeholders might take advantage from ICT use (Kozma, 2008). To develop a shared vision among school practitioners and to establish a decent technical infrastructure as well as providing teacher training programs and opportunities for business-education partnership with the help of policies, various issues should be considered (Lim, 2007; Vallance, 2008). Lim (2007) investigated necessary and sufficient conditions for the effective ICT integration in the classroom and the supporting context of Singaporean schools by doing observations in 15 ICT-mediated lessons, interviewing with 30 Teachers, 10 ICT-Coordinators and 10 principals and doing focus group discussions with 3 groups of 6 students in five primary schools, three secondary schools and two junior colleges. According to the findings of the study, the conditions were listed as follows: Classroom management issues, availability of ICT tools, establishment of disciplinary and educational rules and procedures, division of labor among teachers, teacher assistants and students, orienting activities and learner autonomy, scaffolding strategies for engaged learning and supporting school policies. Based on the findings, for improvement of ICT integration into process of teaching and learning, Lim (2007) presented 3 national level policy recommendations: set new strategies for student ICT competency improvement, constitute ICT competency standards for teachers and students, re-built the form of assessment and reduce the importance of examination grades for optimizing the potential of ICT in education. However, Kozma (2008) argued that there were existing practices without being connected to national ICT polices. Addition to this, even if he stated that non-governmental organizations and business-school partners commonly support ICT projects and programs in the schools, apart from the policies, still there is a need for ICT polices providing shared vision and a strategic rationale in order to sustain the national use of technology in education in the classrooms and schools.

There are also both small-scale and large-scale studies and reports that aimed to promote awareness, provide frameworks and support policymakers, practitioners and planners to form their own national policies for ICT integration into education (e.g., Austin & Hunter, 2013; Ng et al., 2010; Law et al., 2008; UNESCO, 2008). For example, UNESCO published reports such as "ICT competency standards for teachers" (ICT-CST) (UNESCO, 2008) and "ICT-in-Education Toolkit" for policy makers (Ng et al., 2010). ICT-CST was published to provide a general set of guidance/framework for teacher, teacher professional development (TPD) providers and Ministry of Education by merging various determinants of constructing the capacity of teachers to teach effectively with the help of technology under a shared vision of country's general approach to use of ICT in education.

UNESCO ICT-CST presented three-stage framework of educational ICT integration, namely, the technology literacy, the knowledge depending and the knowledge creation approach, and each approach including other sub-components of education system: Curriculum and assessment, pedagogy, ICT use, school organization and administration and TDP (UNESCO, 2008). It was expected that one of the approaches to be adopted by different countries at different development stages for educational change and the change would be demonstrated in their policy goals as well (Ng et al., 2010). ICT-in-Education Toolkit was developed by UNESCO Bangkok in collaboration with the Academy for Educational Development (AED), Knowledge Enterprise LCC and infoDEV/World Bank. While the purpose of the toolkit was to provide help for decision-makers and practitioners in creating the link between the potential uses of ICT and meeting the educational goals, it didn't provide solutions or answer for problems in formulating policies though (Ng et al., 2010).

The ICT-related investments of a variety of countries are represented by several organizations including the Organization for Economic Cooperation and Development, The United Nations and the Bureau of Economic Analysis (BEA) (also see IMF's World Economic Outlook Database and OECD- ICT Investment Database). Moreover, the role of investment in ICT (including hardware and software) in the world economy and its impact on economic growth (e.g. Lapukeni, 2015) have been extensively discussed and well-documented (Akinyokun, Angaye & Ubaru, 2011; Jorgenson & Vu, 2005). However, even though the social, cultural, political and economic aspects are accepted as fundamental factors that influence technological change (Thomas, Haddon, Gilligan, Heinzmann & de Gournay, 2005), the social, cultural (Preston, 2003) and historical dimensions of ICT policy are usually neglected in the studies (Austin & Hunter, 2013; Thomas et al, 2005).

Thomas et al. (2005) determined cultural factors including social structure, temporal structures of daily life, values, communication, and material culture and their influences on experience of ICTs (the adoption and usage of ICTs) for the purpose of creating a guideline to inform ICT policy-makers, business decision-makers and researchers. Preston (2003) criticized that whether European Union (EU) ICT policies and social and economic implementations of new ICT in Europe were linked to the approach or elements of an information or a knowledge based society so as to have an understanding about the relationships among policy initiatives and domains of technical knowledge, culture and information content. Similarly, Austin and Hunter (2013) explored historical, social and cultural impacts on the improvement and practices of school ICT policy by focusing on 1993-2010 time-period publications including interviews with decision-makers and practitioners in the process of policy implementation. The study examined Canada, Northern Ireland and Ireland as three different cases. They proposed that while there has been a large amount of research on the justification for various models of ICT policy implementation in different countries, historical and cultural factors have not been taken into consideration enough to explain the reasons of necessity for different political arrangements, even within the same country.

Due to complex systemic nature of ICT integration, focusing only on investigating individual factors at classroom level (micro-level) such as attitudes towards computer, computer competence and gender difference wouldn't determine the factors that are related to whole educational system (Tondeur et al., 2008a) . Thus, the role of national policies (macro-level) and local school policies (meso-level) on the ICT integration also should be considered in a multilevel approach to explore the impacts of different factors which are originated from different levels and presented by different stakeholders, because there might be a gap between policies and practices related to ICT use in education. In other words, actual use of ICT at classroom level might be different than how it is presented in available ICT curriculum at the macro-level due to implementation of ICT being an important policy issue (Plomp, ten Brummelhuis & Rapmund, 1996).

A study conducted by Tondeur et al. (2007) in Eastern Flanders-Belgium investigated whether there was an incongruence between ICT-related curriculum and actual use of ICT in the classroom with a sample of 570 teachers who were at an age ranging from 22 to 61 years in 60 schools over a survey. Moreover to understand how the ICT competencies were presented at school levels, 53 principals were interviewed. The findings showed that while the improvement of technical ICT skills were the focal point for teachers, integrated use of ICT in the process of teaching and learning was emphasized in the curriculum. Interviews with the principals indicated that there was miscommunication between teachers and principals regarding the implementation of ICT in the schools. Furthermore, overall research findings revealed that the goals of setting ICT competencies by national educational authorities do not inevitably cause a change in practice and they are in conflict with the nature of the school systems. It is more likely to realize a successful and proper technology integration only when policy making process involves teachers and policies made are in harmony with their values, adopted approaches and understanding (Tondeur et al., 2008).

By adopting proposed frameworks or governmental strategic plans in order to employ ICT policies in classrooms for the necessary change, it may not mean that implementation and impact of policies are always successful and as expected or teachers' practices change and adapt immediately. The forces that influence the linkage between policies and implementation are usually discussed to illuminate educational reforms and their foundations (e.g., Ballantine & Spade, 2008; Cohen and Hill, 2001; Tyack & Cuban, 1995). Tyack and Cuban (1995) discussed what factors make the change so troublesome and what could be the solutions. They emphasized that even though the teachers are one of the key actors for successful implementation of policies in the top-down manner of technology integration, they are rarely consulted for their opinions during this process. For this reason, policy-based change is perceived as an externally imposed force by teachers and teachers are more likely to show resistance to it (Fullan, 2001; Mikre, 2011). Moreover, due to unclear and complex connections between policies and instructional practices rather than suggesting the ways of using ICT in the school and in the classroom practice (Dale, Robertson & Shortis 2004; Pelgrum & Plomp, 1993), the policies are implemented in symbolic ways (Tyack & Cuban, 1995). When professional development opportunities and a guide to the instructional and pedagogical practices of the policies to be implemented are not provided to the teachers, they will be lacking knowledge and background required to meet the requirements of the educational reforms to be actualized (Cohen & Hill, 2001; Tyack & Cuban, 1995). This will only result in enforced practices rather than the true understanding and the adoption of the educational reforms (Wagner et al., 2005). Similarly, Cohen and Hill (2001) highlighted that if such resources and plans that are in alignment with the purpose of policies did not exist, policy implementations may fail.

In his study, Younie (2006) refers to the policy implementation in UK as a complicated process and states that it is not very possible to take policies and directly implement them into practice. Five main issues are listed regarding the challenges faced against the implementation: nature of the initiatives that requires many institutions to work together, inconsistency of fundings, the effect of that on resourcing and procurement, changes in educational strategies at the national level, limited effect on pedagogy. In addition, in terms of shaping the policy development, Galvin (2009) has referred to the role that industry of ICT has and the role of international organizations such as OECD. However, the number of studies that analyze the historical, social and cultural determinants of ICT policy seems pretty limited.

2.1.2. Definition of Meso Level and Related Factors

Meso level is defined by Porras- Hernández and Salinas-Amescua (2013) as the conditions, which are described as social, cultural, political, organizational, and economic, founded within the local community and the educational institutions. The ICT integration into practice is enabled when the teachers work in an environment where the technology use is supported by parents, peers, superintendents, and school principals. Therefore, being proximal to teachers, the meso level factors are mostly effective on them through the customs and norms of communities and institutions, instead of acting as the context that the teachers usually experience teaching and learning at. School-related factors such as leadership, school culture, collaboration, and teacher education are the main focus at this level.

2.1.2.1. Administrators, ICT leaders and School Level ICT Integration

The administrators as ICT leaders also play a major role in schools as well as educational policy makers and teachers in the integration of ICT into teaching and learning processes considering the effort to be made in order to increase the technology use in the classrooms (Dexter, 2008; Eickelmann, 2011; Kay, 2009; Mikre, 2011; Sergiovanni, 2007; Vanderlinde, Dexter & van Braak, 2012; Yuen, Law & Wong, 2003). However, this role may either assist or hinder this process of complex change (Eickelmann, 2011; Sheppard & Brown, 2014). School principals have been seen as the agents of the change that are to realize the use of technology for instructional purposes in schools (Sergiovanni, 2007; Yuen et al., 2003) by developing new school-level policies, empowering the related policies (Levinson, Sutton & Winstead, 2009; Sutton & Levinson, 2001; Tondeur et al., 2008) and reconstructing the teaching and learning culture of the school (Fullan, 2001).

In order to accomplish ICT integration into education in an effective and sustainable way, administrators should possess the required ICT skills themselves first, so they can encourage the technology use and the development of a supportive understanding accordingly (Arokiasamy, bin Abdullah & Ismail, 2014). Lack of ICT skills and knowledge may have an impact of principals' beliefs and opinions and cause them experience hesitations during decision-making process (Rogers, 2003). Moreover, administrators should built a comprehensive understanding of curricular, pedagogical, technical, financial, administrator and social aspects of ICT use in education (Kirimi, 2013; Mikre, 2011; Sife, Lwoga & Sanga, 2007) . This is because teachers need to be supported and guided by the principals as school and technology leaders in the school environment, apart from systemic assistance for the ICT integration (Sutton & Levinson, 2001).

Successful school leaders who make progress in developing their schools for twenty-first century education and student achievement with the help of technology integration and implementations possess some characteristics in common (Schrum &

Levin, 2013). In the study of Schrum and Levin (2013), the successful leaders were the ones who had shared leadership approach, promoted teacher support systems, spared time for collaboration, created a shared vision and accepted feedbacks, supported partnership and valued success. Dexter (2008) and Yuen et al. (2003) also reported similar findings about key factors of effective technology leadership. Moreover, in an effort to provide a guideline for the administrators to follow as technology leaders and to ensure effective technology integration in learning and teaching processes, International Society for Technology in Education (ISTE) developed National Educational Technology Standards for Administrators (NETS-A) including a range of skills and knowledge. The most current one was published in 2009 and the purpose of NETS-A was to guide principals in creating an effective learning environment with the help of ICTs and to define professional knowledge and core competencies needed to support their leadership roles (ISTE, 2009). The standards for administrators were categorized as follows: Visionary leadership, digital-age learning culture, excellence in professional practice, systematic improvement and digital citizen. Currently, the NETS-A has changed the perception and creation of technology leadership models that describe how administrators should arrange, operate and evaluate the use of ICT in schools (Sincar, 2013).

The NETS-A has also aimed that principals should acknowledge their roles as inspirational and motivational leaders who provide a shared vision for complete technology integration in terms of educational purposes in order to support cultural and environmental transformation of schools through facilitating a shared vision among stakeholders, developing technology related strategic plans, promoting national level policies and funding to assist the implementation of strategic plans (ISTE, 2009; Sincar & Aslan, 2011). In a supportive way, the importance of the school leader’s vision for successful technology integration was pointed out in many studies (Lim, 2007; Ottestad, 2013; Sife et al, 2007; Tondeur et al., 2008; Yuen et al., 2003). Thus, undoubtedly, the support of administrators is very crucial to achieve success in the integration process due to their ability to prepare necessary and sufficient conditions for technology integration such as employing ICT policies, having leadership skills for ICT use and providing resources as it is pointed out in numerous studies too (Lim, 2007; Sife et al, 2007; Tondeur et al., 2008; Tondeur et al., 2010). On the other hand, setting school-level policies such as an ICT school plan in order to create a shared vision on ICT use in classrooms will be helpful in supporting ICT integration only if teachers are aware of the importance and the meaning of technology plans (Lim, 2007; Tondeur et al., 2008).

As Sergiovanni (2007) emphasized that the effective leadership for ICT integration requires collaboration and participation with teachers and other schools (ISTE, 2009; Tondeur et al., 2008). For instance, in a study, the correlation between the attitudes and behaviors of school leaders about ICT use in their schools and the use of ICT in classrooms by teachers was examined (Ottestad, 2013). The data were collected from 512 primary and lower secondary schools in Norway with the help of a survey. 247 school leaders from different schools and 386 teachers responded questionnaires online. The selected indicators of school leadership for ICT use were digital practice, ICT maturity, assessment and roles regarding ICT and leadership for collaboration. He put emphasis on transformational and pedagogical leadership styles with initial interpretation of items (Ottestad, 2008, 2013). According to the results, the attitudes and behaviors of school leaders about ICT use in their schools correlate with the attitudes and behaviors of teachers. However, only three indicators (digital practice, ICT maturity and leadership for collaboration) were significant but weak predictors of teachers' time spent on PC for pedagogical and administrative purposes. Additionally, all four indicators were able to predict teacher usage of different ICT-tools (e-mail, LMS and presentation software for teaching purposes) and for teachers' life-long learning attitudes.

Technology leadership requires the development of certain skills that will enable the effective technology use in areas such as education environment, school administration, communication, professional development, and of course in individual life (Karatas, 2016). The required standards defining the administration as a profession in Turkey were defined in the study of Karatas (2016). Data collection process included filling in a questionnaire with 7 point Likert-Type Scale by 328 heads of school and leaders in education along with focus group interviews conducted with 30 participants. As stated within the results of research, the school leaders are expected to be proficient in terms of following aspects: (1) knowledge oriented, (2) able to communicate effectively, (3) competent in institution management, (4) being a change leader, (5) being a leader in technology use, (6) being a leader in educational, (7) building good school-environment relations; and (8) being an active part of life and society. Technology leadership was a newer concept compared to other proficiency areas in Turkey (Hacıfazlıoğlu, Karadeniz, and Dalgıç, 2011).

When examining the literature in Turkey in general, it is observed that the school administrators mostly have high level of technology leadership competencies (e.g., Çakır & Aktay, 2018; Eren & Kurt, 2011; Ünal, Uzun & Karataş, 2015; Yorulmaz & Can, 2016;). In the study of Akbaba-Altun and Gürer's (2008), the purpose was to clarify how the school administrators see their role in ICT use in classroom. The result of the study indicated that the roles of administrators could be counted as staff training, establishing communication, facilitation of ICT intergation, maintenance of the infrastructure, developing ergonomics, supervision, leadership, public relations, monitoring, empowerment, and ethics. It was also found that school administrators perceive that they have a big role in ICT practices in classroom. The roles mentioned as communication and supervision were results unique for only Turkey. The school administrators were concerned the most about the role mentioned as monitoring, while they were concerned less about public relations. Therefore, the school administrators were more skillful at monitoring but they probably needed to improve their public relation skills.

In the K-12 school environment, technology leadership, school context and culture all together are considered important for constructing the conditions for the uptake and use of ICT. Vanderlinde and van Braak (2010) introduced these school level conditions as the *e-capacity* of a school. E-capacity was described as “the ability of a school to establish the proper conditions at the school and teacher levels and to keep them sustainably optimized in order to ensure an ICT transformation that is highly effective.” (Vanderlinde & van Braak, 2010, p. 550). In this regard, there are many studies conducted to understand the actual use of ICT in the classroom by the teachers and its relation with the school level conditions (e-capacity) and indicators in a broader manner that is not only examining the leadership concept but also the other related factors (Albugami & Ahmed, 2015; Aydın et al., 2016; Ottestad, 2013; Vanderlinde & van Braak, 2010). Vanderlinde and van Braak (2010) developed an empirically tested conceptual framework from a school improvement perspective to investigate the complex process of the ICT curriculum implementation. Their main focus was on leadership, participation in decision making and collegiality as school improvement conditions, ICT support, ICT coordination, the schools' vision of ICT integration, ICT policy planning and ICT infrastructure as ICT related school conditions; ICT teachers' professional development, teachers' ICT competence, teachers' actual use of ICT as ICT related teacher conditions. They gathered data from 471 teachers in 62 primary schools in Belgium over a survey. In their framework, school level conditions were significantly contributing factors to the use of ICT in education. The conditions of school level and teacher level are defined and put together within the e-capacity model. Four harmonizing concentric circles in total are represented in this model and starting from the innermost circle to the outermost one, the circles represent; Teachers' actual use of ICT, ICT related teacher conditions, ICT related school conditions and School improvement conditions. In the center of these four circles, there lays another circle equally divided in two and these parts represent ICT curriculum implementation and ICT as a lever for instructional change as the core elements (see Figure 2.2).

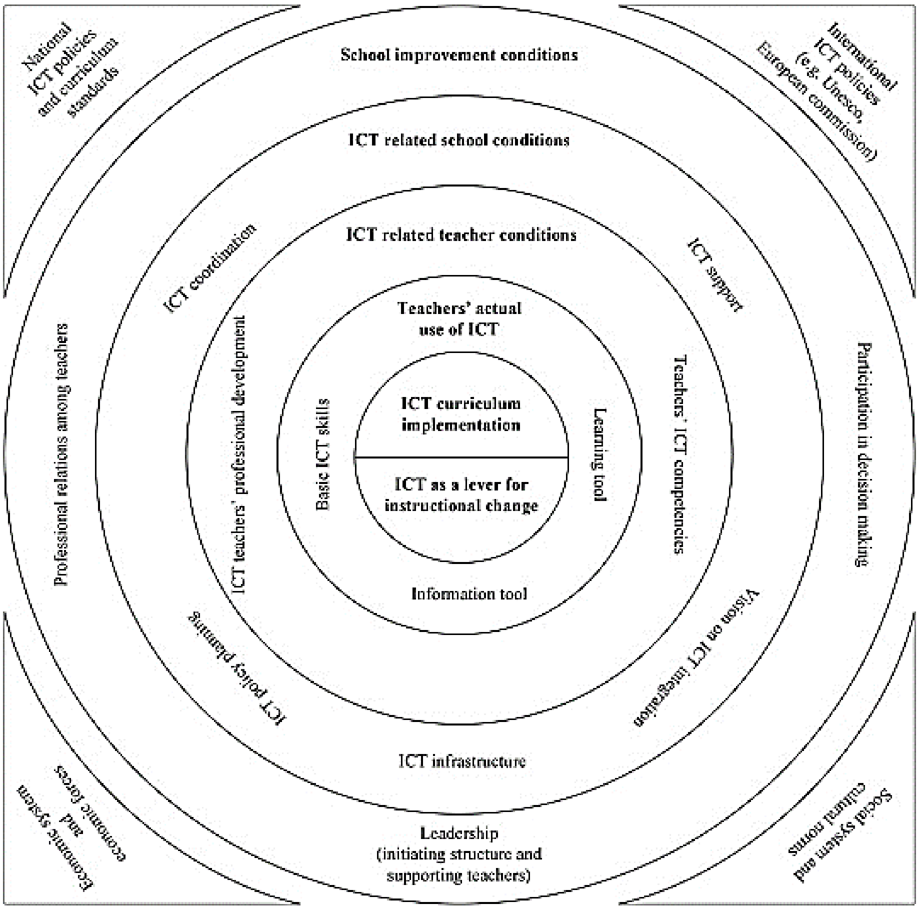


Figure 2.2. E-Capacity Model (Vanderlinde & van Braak, 2010, p. 544)

Inan and Lowther (2010) examined both the effects of teacher characteristics and their perception of school environments on teachers' technology integration in K-12 classrooms by developing a research-based path model. School-level factors were determined as availability of computers, technical support, and overall support, while the teacher-level factors were set as teachers' demographic characteristics (age, years of teaching), their computer proficiency, their beliefs and readiness to integrate technology. It is found that all school level factors and beliefs and readiness of the teachers are mutually correlated when technology integration is considered. Technology integration is positively affected by the beliefs and readiness of the teachers. However, with the use of a limited number of variables and sub-components of the selected variables in the study, they were able to provide only a limited explanation regarding the technology integration and the variables used. Thus, school culture, teachers' workload, pedagogical beliefs, previous trainings, and experiences were suggested to be included in the future studies. Sub-components of overall support suggested to be established as administrative support, community support, and peer support.

School-level factors can either facilitate implementation of ICTs in some schools or may hardly work in other schools (Eickelmann, 2011; Tondeur et al., 2008). For example, the multi-case study of Eickelmann (2011) was an attempt to identify the factors that support and hinder the success and sustainability of ICT implementation in 6 German schools and their classrooms from a school improvement and development perspective. Just like many studies did (eg. Tondeur et al., 2010), this study also showed that school principal's support and leadership skills play a vital role in ICT implementation process. The cooperation of the schools with external partners, development of in-school collaboration, ability of coping and responding to new digital trends, and capacity to cope with process level problems were revealed to be the most supportive and common factors in successful schools. Failure to continue developing pedagogical concepts while still financially supported and/or relaying much on individuals who are passionate and accountable for driving innovation within the school were found to hinder schools' ICT implementation. The absence of comprehensive support systems for the use of ICT in schools has been identified as a preventive factor for both pedagogical and technological knowledge aspects of teachers.

At the school level, another important factor for successful ICT implementation is the existence of school's ICT vision and policy. Inclusive of 31 primary schools in Belgium, a study conducted to investigate the content of school-based ICT policy plans and their developmental process with the help of a content analysis, and a semi-structured interview with the school leader or the ICT coordinator. In this study, Vanderlinde et al.'s (2012) revealed that the ICT leadership practices, namely, setting direction, helping people improve themselves and making the organization work are more likely to assist the creation of ICT policy plans to define a variety of functions and responsibilities for leaders and teachers. Additionally, they determined three type of ICT policy plans being used in the schools: (1) an ICT policy plan as a vision blueprint, (2) a technical inventory and (3) a comprehensive ICT policy plan. While the plans were being used for different purposes, different approaches were adopted in the development and implementation of the plans, such as data-driven decision-making processes, the support of ICT training activities, and monitoring activities. It is unclear whether the comprehensive plans created by the processes highlighted in the study are more effective at achieving their objectives.

2.1.3. Definition of Micro Level and Related Factors

This level is all about what is going on in the classroom environment, which involves teachers, students and ICTs. Pedagogical practices can be an example for this level. Conditions affecting the learning process in the class are the primary concern of the micro level context. Resources available to be used in learning activities, norms, and policies may constitute these mentioned conditions along with the goals, expectations, preferences and beliefs that the students and the teachers develop as they interact with each other (Porras- Hernández & Salinas-Amescua, 2013). This context level is where the teachers largely consider themselves as having the comfort at most and the relatively more independence. Mutual expectation may be of great importance at the micro level.

2.1.3.1. Classroom Level ICT Integration and Teachers

At the classroom level, the main actor is the teacher as the policy implementer. Teachers play an important role in the implementation phase of educational innovations and the realization of a curriculum change (Vanderlinde & van Braak, 2011). The local capacity and the teachers' will are determinative in a critical way when it comes to actualizing the current reforms and policies (McLaughlin, 1987). Policy initiatives made in order to properly train the teachers and financial resource allocation accordingly can be defined as the local capacity according to the indications of McLaughlin (1987). Yet, the policy intervention is less effective on the attitudes, motivation, beliefs and the will of teachers. Among other factors, variables that are related to teachers have the strongest effect while predicting the technology integration as highlighted by Becker (2000) (cited in Sang, 2011). Therefore the projects related to ICT integration should place the teachers at the core.

The ability of the teacher to perform a successful practice depends on a wide range of factors. In the literature, there are many sources that examine factors that influence teachers' adoption and integration of ICT in teaching and learning processes. When the literature is examined, it is seen that the factors affecting the technology integration at classroom level can be categorized under five main headings. These are (1) hardware and network infrastructure status, (2) support, (3) the educational status of the teacher, (4) teachers' perception and beliefs , and (5) time, heavy program load and curriculum (Aldemir & Tatar, 2014; Aslan & Sendurur, 2017; Ertmer, Ottenbreit-Leftwich, & York, 2007; Ertmer & Ottenbreit-Leftwich, 2010; Ertmer et al., 2012; Inan & Lowther; 2010; Lawrence & Tar; 2018; Özdemir & Kılıç, 2007; Tour 2015; Vanderlinde & van Braak, 2011). In this context, prominent barriers and enablers affecting teachers' technology integration are presented in a more detailed way in line with Ertmer's (1999, 2005) definitions in Table 2.1.

Table 2.1. *Prominent factors affecting teachers' technology integration*

Type of Barriers/ Enablers	Extrinsic	Intrinsic
Resource	Hardware/Software Internet Access Access/Lab/Resources Infrastructure Funding	Technology skills/knowledge Integration knowledge Vision of benefits/purpose Goals for Technology use Beliefs about the role of technology
Policy	Administrative Policy and support Technology Support Curriculum/Assessment/Strategies Professional Development Culture/Social Support Leadership Training/ Training Time Teacher Workload Teacher Time Peer Support	Pedagogical knowledge Professional attitude Motivation Teacher-student role

Barriers to integration shaping around or within the teachers can be related to the factors developing outside or can be endogenous. Mentioned barriers presented by Ertmer (1999), which can be internal and external, possess various characteristics. External barriers that are called first-order barriers are inclusive of a lack of access to computers, software, planning time, or administrative support. Internal barriers that are called second-order barriers are related to the beliefs of teachers regarding the instructional technology, teaching methodologies that are preferred, and willingness to make changes about classroom practices. For the first-order barriers, it is easier to get recognized and to be fixed, although for the second-order ones, the beliefs of the teachers and their everyday practices in relation to teaching are required to change majorly (Ertmer, 1999). Other reasons why the teachers are less likely to realize technology use up to highest possible potential can be named as follows; the fact that classroom space is limited, teachers may be not willing to let students into the labs, and the lack of access to technology at the homes of teachers and students (Zhao & Frank, 2003). In addition to these barriers, limited time and limited resources that hinder the technology implementation process at the classroom can be counted (Gök & Yıldırım, 2015; Pamuk, Cakir, Ergun, Yilmaz, & Ayas, 2013; Zhao & Frank, 2003).

Hardware and network infrastructure status - It is important to control all environmental factors to enable that teachers should be able to perform an effective teaching in the classroom, to achieve learning objectives with a student-centered approach and for teachers to be able to do all these within a certain time period. Inefficient infrastructure of schools, connection problems, equipment deficiencies such as the absence of computer etc. (Cagiltay, Cakiroglu, Cagiltay & Cakiroglu, 2001), difficulties experienced regarding financial resources and crowding of classes are considered as external factors adversely affecting integration (Afshari et. al., 2009 ; Chen, 2010; Fu, 2013; Inan & Lowther, 2010; Lowther et al., 2008; Kaya & Usluel, 2011; Mikre 2011; Özdemir & Kılıç, 2007).

Support- Studies in the literature show that teachers receive support in the technical, technological and pedagogical sense is an effective factor in the integration process (Fu, 2013; Göktaş et al., 2009; Inan & Lowther, 2010; Kaya & Usluel, 2011; Lowther et al., 2008; Özdemir & Kılıç, 2007; Teo, 2011; Teo, Chai, Hung & Lee, 2008). For example, in a technological and pedagogical point of view, whenever there are no support structures for technology use in a holistic manner, the process gets hindered according to the findings of Eickelmann (2011). Besides, the support provided by the administrators at the process of integration, the support that the teachers give to each other, elements such as reward, appreciation and school culture are among the important factors affecting the process. In addition, Teo and van Schaik (2009) indicate that teachers adopt a positive attitude towards technology when they find technology useful and easy to use, so they emphasize on the factor of easing the conditions.

The Educational Status of the Teacher- The focus of integration is the teacher, and although the support is given, most of the responsibility at all stages belongs to the teacher. Teachers' experience gained and education received while at faculties and due to in-service trainings, to be able to make the planning right, to manage the integration process correctly and most importantly to choose the appropriate method for achievements are important factors affecting the process according to the literature (Cagiltay et al., 2001; Chen, 2010; Fu, 2013; Göktaş et al., 2009; Gülbahar & Güven, 2008; Özdemir & Kılıç, 2007; Teo & van Schaik, 2009). Lack of knowledge due to the educational status of the teacher is the main barrier to technology implementation (Fu, 2013; Göktaş et al., 2009; Gülbahar & Güven, 2008; Ipek, Ipek & Acuner, 2011; Lowther et al., 2008; Oktay & Çakır, 2013).

Teachers are the most determinative force bringing along the success or failure regarding the policies, projects or interventions. Therefore, in order to improve and enhance the educational system, meticulous trainings must be supplied for the teachers in a mandatory manner. It is required that not only the teachers of "ICTs in Education" course but all the teacher educators should possess the necessary skills that enable them to integrate ICT into the activities of learning and teaching (Majoka, Fazal and Khan 2013). ICT integration in education should be supported and based by the teachers' professional development (Mikre, 2011). For the ICT integration and in order to get pupils prepared against 21st century, it is required to take further actions going beyond the merely school practice. Trainings that are focused on subject-related pedagogical approaches are one of the key aspects that is missing (Eickelmann, 2011).

Teachers' Perception and Beliefs - The perceptions and beliefs of the teachers are the significant intrinsic factors which defines the role of teachers in technology integration along with their effectiveness. These perceptions and beliefs regarding the pedagogical use of technology in education would have an effect on the way that teachers prefer to implement technology integration in general. The factors related to this topic are lack of self-confidence, attitude, self-efficacy, technological complexity, low expectations of the teacher, inability to provide clear objectives and to be unsure of the benefit of integration. (Chen, 2010; Fu, 2013; Gülbahar & Güven, 2008; Ipek et al., 2011; Lowther et. al, 2008; Özdemir & Kılıç, 2007; Sang, Valcke, van Braak & Tondeur, 2010; Teo et. al, 2008; Teo & van Schaik, 2009). According to the study findings of Eickelmann (2011), the absence of appreciation and acceptance against the value of technology use in education covering both learning and teaching processes and the lack of required competencies to incorporate technology are the factors that hinder the integration process. In addition, the value that the teachers give to technology use in education is pretty important in terms of pedagogical practices to be applied in schools regarding ICT use in particular (Wong & Li, 2008).

Technology may be used to realize the whole curriculum or it could be used only as a complementary educational tool by the teachers. The different levels of ICT use is mostly shaped by the teachers' different beliefs and approaches adopted regarding the pedagogical use of technology. Ertmer's findings also support that the practices of technology integration are to be performed more easily if they are established as in alignment with the beliefs of the teachers (Ertmer et al., 2012). The philosophy of teachers about how the learning of the pupils take place have a great impact on these beliefs. When the teacher is in opinion that the pupils experience the learning process upon the teaching of the teacher explicitly, the activities made in the classroom will be shaped around traditional approaches such as chalk-and-talk approach. The adoption of more traditional approaches in education mostly means low levels of technology integration within the classrooms (Hermans, Tondeur, van Braak, & Valcke, 2008). As a result, the technology related practices applied within the classroom will remain limited to complementary use of it such as only employing technology in demonstrative activities.

Time, heavy program load and curriculum- Many of the teachers actually complain about the curriculums since they think that the curriculums are prepared on the basis of student-centered approaches are very intensive and that they do not have enough time to integrate the technology and to do the required preparation for the use of technology and they count the intense curriculum and limited time as the barriers to technology use (Aldemir & Tatar, 2014; Chen, 2010; Fu, 2013; Gülbahar & Güven, 2008; Kaya & Usluel, 2011; Lowther et al., 2008; Marwan & Sweeney, 2010; Özdemir & Kılıç, 2007; Teo & van Schaik, 2009). The necessity of rushing to complete all the current program within the given time cause teachers to hang back from some actions like using technology and prevents them from going out of their daily routines.

The results of the mentioned research studies made in Western countries are supported by a qualitative study from Indonesia which proposes that in promoting learning and teaching processes, beliefs and attitudes of teachers, organizational culture and external influences can significantly affect the educational technology integration (Marwan & Sweeney, 2010). It is also suggested that skills, workload, strategic planning, ownership, resources, professional development and leadership as some significant factors might possess an effect on successful integration in a negative way, so they should be receiving attention too.

Figure 2.3 summarizes the major influential factors and actors covered under each level and the relationship between them.

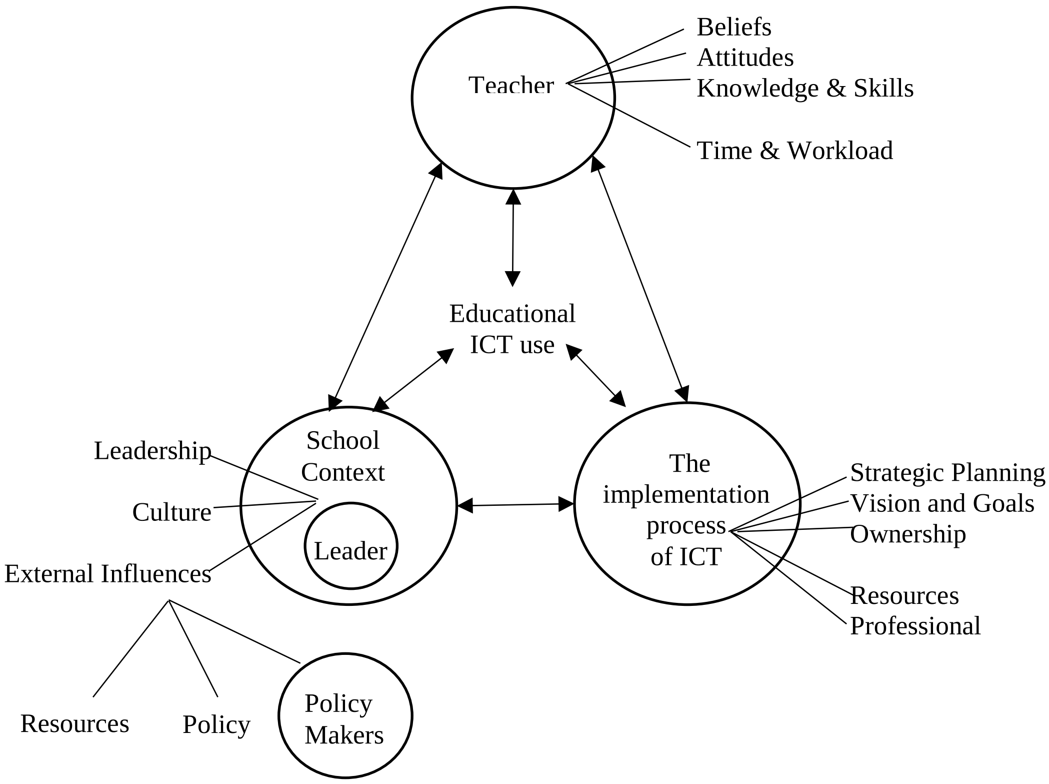


Figure 2.3. Major influences on the educational use of ICT in the classroom

2.2. Gap in the Literature

The process of technology integration into education, the factors influencing successful ICT implementation and teachers' use of ICT have been explored worldwide since the potential of technology in education has been recognized. Different qualitative and quantitative methods or combination of them are employed in this exploration process in line with the identified problem and researchers' focus. At the international level, countries conduct research to find solutions to their specific ICT integration problems in their unique education systems shaped by their social, political, economic and cultural structure.

Since communities differ in terms of effective factors, aspects, key players as well as cross-nationally comparable indicators that are found, emphasized and reviewed in the studies, it is revealed that educational ICT implementation and practices of some countries are more advanced than other countries according to comparative studies covering a vast of factors and many countries studied (e.g. UNESCO, Eurydice, TALIS, OECD, The World Bank, European Schoolnet). Therefore, learning the practices that make any country successful can offer the ways for development to the other countries in terms of ensuring successful ICT integration into education, but only if contextual differences of the countries are considered. Because the best practices would not provide a certain formula directly for determining the optimal level of ICT implementation and integration due to differences in the structure of education systems, so the best practices should be specifically tailored according to the educational system of the country in question.

The best practices of Finland and S. Korea can teach valuable lessons for Turkey due to their recognized success in student level of achievement, teacher education and technological reforms. The comparison of education systems (Balbay & Kilis, 2018; Boydak & Yaraş, 2017), policies (Ağır, 2010; Goktas & Yildirim, 2003), curriculums (Goktas & Yildirim, 2003; Özmen, 2017), teacher education (Aras & Sözen; 2012; Altıntaş & Yeşiltepe, 2016; Balbay & Kilis, 2018; Cirit Gül, 2016; Göçen-Kabaran & Görgen, 2016) and state of teaching profession (Aslan, 2015) among different countries including Finland and/or S. Korea is common research practice either by analyzing relevant documents or reviewing organizational reports and literature in Turkey. Only few of these studies have conducted triangulation of their data by making interviews with experts. The selection of countries is usually based on the large-scale research results of well-known organizations such as PISA.

The relevant comparative case studies conducted in Turkey mostly include only 2 different countries – one of them is Turkey- as an attempt to learn from others' practices. In order to reach this goal, generally document analysis is carried out or data from international reports are used. For example, in their study, Başak and Ayvacı (2017) analyzed the integration process of the FATIH Project as compared to the ICT integration process in S. Korea as it is a leading country setting an example with its similar applications in the education system. They utilized document analysis method as a data collection tool from a descriptive scanning approach. Based on the findings obtained through this study, it can be told that both of the countries possess both similar and different characteristics at the same time. Hardware, software and the networks resembled each other while systems of training and certification for the teachers, context form and management and e-learning standards were the distinct aspects accordingly. Some suggestions for the authorities and who may they concern are shared through this study regarding teachers education and the content to be established accordingly.

Some other research include more than two countries and conduct comparison studies for revealing challenges, successful practices, similarities and differences amongst selected countries. However, these studies include only one of the two countries studied in our research- Finland or S. Korea. For instance, Özmen (2017) investigated technology integration into curriculum in five different countries in different continents, namely, Singapore, Australia, the United Kingdom, New Zealand and Finland in order to address the conditions necessary for the realization of a successful curricula. She also examine the technology integration policies of these countries. Based on the curriculums shared through the official websites belonging to the educational institutions, analysis of these countries' curriculums are provided in detail. The discussion of the study findings are made on the basis of principles to be considered regarding the curriculum design and concerned recommendations are shared. Likewise, there exist another study that examined differences and similarities observed between the education systems of EU countries and Turkey in regard to ICT integration into curricula of primary education and education programs offered for the teachers (Goktas & Yildirim, 2003). That is a comparative study covering 15 countries in total that are EU members, which include Finland and Turkey. Official documents provided the required data for this study. This mentioned study also suggested that EU countries and Turkey demonstrate differences and similarities regarding ICT integration in the curricula of primary education and teacher education programs as a result. The fact that Turkey along with EU countries experience a significant increase in the value given to the ICT use in education is presented through the results of the study. However, Turkey have a high number of pupils and also teachers to be educated through its educational system policies and its technological infrastructure remains insufficient accordingly. All these facts pose a great challenge with the effect of poor economic conditions that Turkey have.

When the literature review in this thesis and the comparative studies mentioned above are considered, country comparisons are generally made through document analysis. During their research, the researchers did not actually go to the countries they make the comparison of and they did not include the method of presenting these document analysis results by enhancing and verifying them through different qualitative ways. Furthermore, rather than a holistic approach, different small parts of the whole have been examined and investigated from different perspectives. In the literature, statistical information gathered from the reports obtained through the short term visits is available, but a study produced by blending it with the experience obtained through long term visit and interviews made in place in the studied countries is not available among the resourced reached.

The contribution of the study to Turkish literature; (1) the examination of technology integration and the teacher's use of ICT based on many aspects with a holistic approach in their own context of the countries, (2) besides the document analysis and literature review, to provide confirmed data and information, which are more in-depth, comprehensive and enhanced, with the semi-structured interviews made with teachers, school principals and ICT coordinators, (3) to provide tailored recommendations by making more accurate interpretations with the gained experiences based on a long term visit (4 months), observations and field notes, (4) to offer more diverse and fair solutions by making a triple compare study including Finland, S. Korea and Turkey at the same time and by making use of the differences and the similarities, (5) Examining the differences and similarities by revealing the aspects affecting the technology use of teachers in the classroom by using a multi-level ecologic perspective.

The contribution of the study to international literature; (1) To deliver the current situation by examining the aspects affecting the ICT use of teachers in different countries once more, (2) to provide information for the relevant literature in Finland and S. Korea based on the results of the interviews and observations made in those countries, (3) to provide a set of data collected by the same researcher within a study conducted in 3 different countries rather than sharing any study results obtained through only documentation review and policy comparison, (4) To share recommendations for the future studies.

2.3. A descriptive background information

Educational indicators from an international perspective are categorized under six topics to help compare countries' educational structure in their own context (Matheson et. al, 1996). These categories are contextual factors, societal support for education, achievement and attainment, participation and student flow based on their attendance record, education and labor market destinations, and education institutions. Moreover, education system structure and governance, standards of curriculum, assessment system, and teacher training and certificate system are additionally covered. The related descriptive information and their scope given in this part were written in the framework of educational indicators from an international perspective. New indicators emerged over time, which were not covered in the framework, were added if it would be necessary to provide different perspectives regarding the background information and in-depth description.

2.3.1. Background information for the observed countries

The countries and their context are statistically described and briefly related educational indicators are provided.

2.3.1.1. Contextual factors

The education system of a country is not independent of its own population, economic status, or situations affecting the society. In other words, out-of-school situations create the context in which the education system functions. The indicators of contextual factors describe out-of-school situations as follows:

Land size and Population: An education system, its organizational structure and infrastructure are designed under the influence of the population of countries and the land size of them. For instance, the countries having a large population may have a large number of school-aged individuals and the demand for educational services would be higher. Moreover, in countries with large land size, issues related to uniform or sufficient provision of educational services may occur due to possible resource management problems. On the other hand, big populations might mean an efficient distribution of educators within wider areas, which allows to better educational opportunities. Population size and density, particularly at extremities of large and small, is a critical factor in determining a centralized education system's ability to provide a wide range of services. However, other factors such as culture, history and economics have a greater influence on an education system.

Finland consists of 19 regions with unique characteristics, while S. Korea is divided into 9 provinces including 7 metropolitan cities. Additionally, Turkey has 7 regions which includes 81 provinces. According to United Nations (2017), the population of Finland is 5 523 000, the population of S. Korea is 50 982 000 and the population of Turkey is 80 745 000. Estimated population density, which was calculated as people per square of land size, in Finland was 18.13, in S. Korea was 527.92 and in Turkey was 104.91 in 2017 (World Bank, n.d.).

Moreover, according to OECD (2019), 59.1% of Finnish population live in rural regions while 28.9% of the population live in urban regions in 2014. S. Korea has only 17.2% of its population living in rural areas, while 69.6% of S. Korean population live in urban areas. People who live in rural areas in Turkey consist of 24.9% of the total national population while 51.7% of Turkish population live in urban regions (see Table 2.2).

Table 2.2. *Land size and Population*

Land area and Population	Finland	S. Korea	Turkey	OECD average
Regions	19	9	7	-
Population	5 523 000	50 982 000	80 745 000	-
Population density (people per sq. km of land size)	18.13	527.92	104.91	-
Population distribution, Rural Regions	59.1%	17.2%	24.9%	25.1%
Population distribution, Urban Regions	28.9%	69.6%	51.7%	48.2%

Youth and Population: The proportion of individuals who are aged from 5 to 29 in a country's total population may help estimating the demand for school enrollment in the country, in turn, the possible demand plays a role in determining how much budget would be invested in education. Although the exact investment is not necessarily determined by the possible demand, countries with a large number of individuals in the specified age range allocate more budget for education. Since primary, middle and high schools, including compulsory education were in the scope of this research, to provide the number of school-age population (less than 15) may be helpful to understand more about the resource management performed in each country.

Among OECD countries, Turkey has one of the largest percentage of young people aged less than 15 (24, 3% of Turkish population), while S. Korea has one of the lowest percentage of young people aged less than 15 (14, 3% of S. Korean population) in 2014 (OECD, 2019a). In Finland, young people aged less than 15 makes 16.4% of total population. For more detailed information please see the Table 2.3 (UIS, 2014, UIS, 2014a).

Table 2.3. *Youth and Population*

Youth and Population		Finland	S. Korea	Turkey
Youth Population aged less than 15 (%)		16, 4	14, 3	24,3
Youth Population aged less than 15 (in thousands)		894	7 171	19 925
Population 15-24 years (in thousands)		657	6 808	12 863
School-age population by education level (in thousands)	Primary (7-12) (6-11) (6-10)	349	2 820	5 234
	Secondary (13-18) (12-17) (11-17)	367	3 561	10 579

Expenditure: Educational expenditure of countries show their ability to fund education. Organizations such as OECD and UNESCO use two measures to compare education spending of countries: a share of gross domestic product (GDP) and total expenses (public and private) per student. GDP per capita is a measure used to compare the economic power of countries in proportion to their populations. The countries which have higher GDP per capita generally provide more budget for the educational services. In this context, according to the data of United Nations Statistics Division (UNSC, 2019), Finland has the highest GDP per capita ($ 45 670) while Turkey has the lowest GDP per capita ($ 10 546). S. Korea remains somewhere in between both countries by a $ 30 546 GDP per capita in 2017 (see Table 2.4).

The educational expenditure allocated for each child provides a measure of the average investment made for each student in the education system. In 2015, the average of educational spending per student from primary to post-secondary non-tertiary education among OECD countries was USD 9 401 (OECD, 2018). While Turkey (USD 3 715) spent less money than the average, Finnish (USD 10 025) and S. Korean educational expenditure per child (USD 11 688) was above the average.

While the payment provided for both public and private schools by the government is defined as public spending on education, private spending on education refers to expenditures funded by private sources such as households or other private corporations or etc. This expenditure includes educational tools and school tuitions, cost of transportation and food cost. Educational expenditure on educational institutions from all public and private sources as percentage of GDP was 5.4 in S. Korea in 2015 at primary to tertiary level (OECD, 2018). It was 5.0 in Finland and was 4.4 in Turkey while OECD average was 4.5. In 2015, the share of GDP for public spending on education from primary to tertiary was above the OECD average (4.0) in Finland (5.6). However, the share of public educational expenditure of S. Korea (4.1) and Turkey (3.8) were below the OECD average. Furthermore, the share of GDP for the expenditure on all private educational institutions was higher in S. Korea (1.67) than in Finland (0.09) and Turkey (1.0) in 2015 (OECD, 2018).

Table 2.4. *Educational Expenditure Indicators*

Educational Expenditure Indicators	Finland	S. Korea	Turkey	OECD average
GDP per head (PPP based), USD	45 670	30 546	10 546	-
Educational spending per student from primary to tertiary education, USD	10 025	11 688	3 715	9 401
Total expenditure as percentage of GDP	5.0	5.4	4.0	4.5
The share of GDP for public spending on education	5.6	4.1	3.8	4.0
The share of GDP for the expenditure on all private educational institutions	0.09	1.67	1.0	-

2.3.1.2. Enrollment and Attainment

Education, enrollment and attainment status of the countries were covered under this topic and all information given were summarized in Table 2.5.

Education Status: Literacy rate may be a way of predicting the success of the education system in countries, but it may not be a clear indicator alone to understand the essence and the quality of the entire education system. For example, youth literacy rate among the population aged 15 to 24 is 99.49 in Turkey (UIS, 2016), while youth literacy rate of Finland and S. Korea is virtually close to 100% too. However, math, science or literacy performance of Turkey ranks way below than of Finland and S. Korea (see Table 2.6). According to The World's Most Literate Nations (WMLN) study, the literacy rate of countries was calculated based on the role of newspapers, libraries, inputs and outputs of education system and computer availability rather than actual reading ability of people (Miller & McKenna, 2016). Among 60 countries, Finland was ranked the 1st while S. Korea was ranked 22nd and Turkey was ranked 50th.

Enrollment: In all three countries, pre-primary education is not compulsory. However, pre-school education is important for later stages of schooling and to constitute a base for lifelong learning while ensuring equal access to further education opportunities. In S. Korea, 98% of children -boys and girls without any gender difference who were aged from 3 to 6 participated pre-primary school while this percentage was 83 for Finland for both genders. However, in Turkey, 30% of female children and 31% of male children participated pre-primary school in 2016 (UIS, 2016a). When the primary school participation compared between the countries, net enrollment ratio of Finnish students aged from 7 to 12 was 99% for girls and 99% for boys in 2016 (UIS, 2016a). This ratio was 96% for girls and 96% for boys in S. Korea, while net enrollment ratio of Turkish students was 94% for girls and 95% for boys.

Attainment Status: Enrollment ratio still doesn't give the whole picture regarding participation. Because, the students who enrolled to primary school may not be able to continue or complete their education due to absenteeism, dropping out of school, lack of teachers, insufficient facilities or lack of access to schools. This situation is seen as an equality issue in education system.

In Finland, the proportion of children of school-going age that are not enrolled in primary school was only 0.8% for girls and 1.0% for boys in 2016 (UIS, 2016b). This proportions were relatively high in S. Korea in 2016: Out-of-school children of primary school age in S. Korea was 3.3 % of all female children of school-going age and 3.6 % of all male children of school-going age. Moreover, the proportion was at the highest level in Turkey among the selected countries: Out-of-school children of primary school age in Turkey was as follows for girls and boys in 2016, respectively: 6.0%, 5.2% (see Table 2.5).

Survival rate to last primary grade as an indicator helps tracking the progress of students in primary school, regardless of grade repetition. Moreover, this indicator also demonstrate drop-out-rate of students. The survival rate to the last grade was 100% of all children enrolled in the first grade of primary school in Finland in 2014 and in S. Korea in 2012. However, this rate was 88% of all children enrolled in the first grade of primary school in Turkey in 2014 (UIS, 2016c).

According to data presented by UNESCO in 2016 (UIS, 2016a), the net enrollment rate for both sexes in lower secondary school was 96% and 93% of all children of primary school-going age in Finland and S. Korea, respectively. But, the net enrollment rate for both sexes in lower secondary school was 86% of all primary-school age children in Turkey. Additionally, net enrollment rate for both sexes in upper secondary school was 96% of all upper secondary school-going age children in S. Korea, while it was 92% in Finland. Turkey (79%) had again the lowest net enrolment rate among selected countries. At the overall secondary school level, S. Korea had the highest net enrolment ratio, 98 % for girls and 97 % for boys, while Turkey had the lowest net enrolment rate, 85 % for girls and 86 % for boys in 2016.

Table 2.5. *Enrollment and Attainment*

Enrollment and Attainment		Finland		S. Korea		Turkey	
	Gender	F	M	F	M	F	M
Literacy rate rank (Miller & McKenna, 2016)	Final Rank		1		22		50
	Computers		8		17		46
	Educational System Input		18		47		22
	Libraries		10		42		55.5
	Newspapers		1		8		54
	Education - Test Scores		2.5		2.5		44
Pre-primary school participation, Net enrolment ratio (%), 2016, (aged 3-6)		83	83	98	98	30	31
Primary school participation, 2016, (aged 7-12)	Net enrolment ratio (%), 2013	99	99	96	96	93	95
	Out-of-school children of primary school age, 2016 (%)	0.8	1.0	3.3	3.6	6.0	5.2
	Survival rate to last primary grade (%)	100		100		88	
Secondary school	Lower secondary, Net enrollment rate for both sexes (%)	96		93		86	
	Upper secondary, Net enrollment rate for both sexes (%)	92		96		79	
	Secondary school, Net enrolment ratio (%)	96	96	98	97	85	86

2.3.1.3. Achievement and Students

Many countries regularly determine the success levels of their students through large scale tests such as The Progress in International Reading Literacy Study (PIRLS), Trends in International Mathematics and Science Study (TIMSS) and Program for International Student Assessment (PISA). Thus, the achievement levels of students can be compared within the country as well as to the other countries (Rutkowski, Gonzalez, Joncas & von Davier, 2010). In this part, PISA test results were considered because the progress of students could be more clearly tracked as more tests were applied.

PISA is an international standardized assessment for 15-year-old school students. The assessment is developed in collaboration with the participating countries. 43 countries in 2000, 41 countries in 2003, 57 countries in 2006, 62 countries in 2009, 65 countries in 2012, and 72 countries in 2015 were participated in this survey. The tests are generally employed between 4500-10000 students from each country.

Student Performance: Finnish and S. Korean students performed well in comparison to their peers in Turkey in math, science and reading examinations conducted between years 2003 to 2015 (OECD, 2019c; 2019d; 2019e). Table 2.6 shows the respective performance areas, scores and rankings within all participating countries at the relevant year. While S. Korea and Finland were ranked first or second in any performance area until 2012, Turkey has never been able to perform so well. In the examination held in 2015, ranking of S. Korea and Finland dropped in all performance areas. The participation of new countries (Singapore, Hong Kong, Macau- China and Chinese Taipei) to PISA also changed the ranking for top 10 countries. Turkey still remained ranked as 38th or 39th out of 44 countries in any performance area in 2015. All of rankings of Finland and S. Korea were still well ahead of the rankings of Turkey in any of the subject categories.

Table 2.6. *Student Performance in each subject area*

Students performance			Finland		S. Korea		Turkey		OECD avg.	Avg. of all countries
	Year	# of all countries	Score	Rank	Score	Rank	Score	Rank	Score	Score
Performance in Math, total perspective, PISA	2003	41	544	1	542	3	423	33	500	489
	2006	57	548	1	547	3	424	43	498	484
	2009	62	542	2	546	1	445	41	496	465
	2012	65	519	6	554	1	448	44	494	470
	2015	72	511	11	524	6	420	50	490	461
Performance in Science, total perspective, PISA	2006	57	563	1	522	7	424	47	498	478
	2009	62	554	1	538	10	454	42	495	471
	2012	65	545	2	538	4	463	43	501	477
	2015	72	531	5	516	9	425	54	493	465
Performance in Reading, total perspective, PISA	2003	41	543	1	534	2	441	32	494	488
	2006	57	547	2	556	1	447	37	492	484
	2009	62	536	2	539	1	464	39	493	464
	2012	65	524	3	536	2	475	42	496	471
	2015	72	526	4	517	7	428	50	493	460

Social inequality and Schools: While comparing the results of international assessments, variation in student performance within countries and mean performance after taking account of socio-economic status should be taken into consideration in order to eliminate inequalities in education systems among countries. For example, while in many countries, performances wouldn't be changed after and before taking account of socio-economic status, mean mathematics performance of Turkey would be around the OECD average in 2012 rather than below if social-economic profile was taken into account (OECD, 2013). The actual ranking of Finland and S. Korea in math performance would drop by taking account of socio-economic status they had.

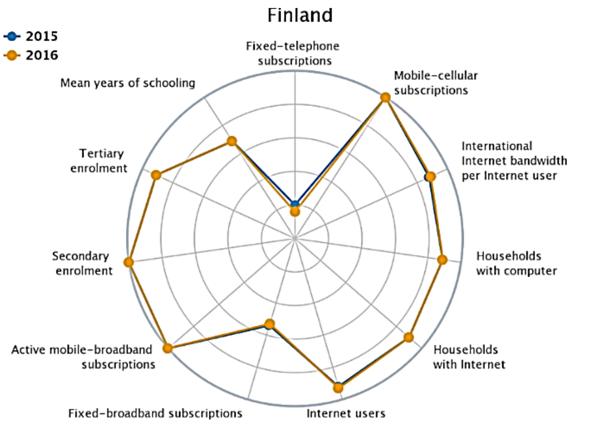
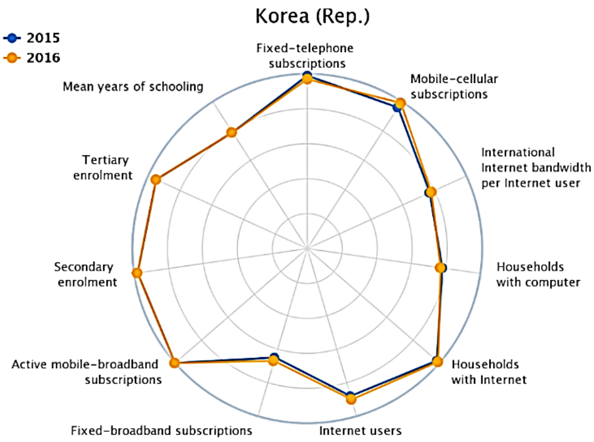
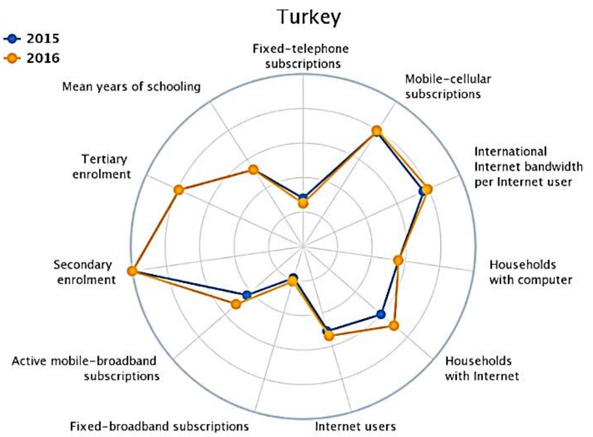
The difference regarding the Finnish students' PISA performance in math and science was observed within the schools itself rather than among the schools. For example, between-school variation as a percentage of the average total variation in science performance in Finland was 8% in 2015, while within-school variation as a percentage of the average total variation in science performance was only 6% (OECD, 2016). This difference was explained by the variations occurred among students' socio-economic status. In Finland, differences in the test results of the students with varying socio-economic backgrounds and differences between advantaged and disadvantaged schools were relatively small. This was indicative of that the Finnish education system was based on equality in education. In contrast, both Turkey and S. Korea had relatively large variations respectively 60% and 45.3% which generally indicates that the education systems are more effected by the social inequality.

2.3.1.4. ICT Status and Use

International Telecommunication Union (ITU) has been publishing “Measuring the Information Society Report” annually in relation to ICT development level of countries since 2009. ICT development is seen as one of the facilitators of becoming an information or knowledge society in the reports. ICT development index (IDI) is calculated based on the combination of three areas including ICT readiness (infrastructure, access), ICT use (intensity) and ICT capability (skills) of countries. Overall calculation of 11 indicators under the areas reflects the ICT Impact (outcomes).

According to the report in 2016 (ITU, 2016), S. Korea was the first ranking country in both 2015 and 2016, with an IDI value of 8.78 and 8.84, respectively. Finland was ranked 14th whilst Turkey was ranked 69th out of 167 countries in 2015. Moreover, with the decline in the ranking of Finland and Turkey, they were listed as 17th and 70th country respectively among 175 countries in 2016. The Table 2.7 below demonstrates the rankings and the values of ICT development index and sub-indexes in detail along with the charts specific to the countries which represent 11 indicators.

Table 2.7. *IDI values of selected countries, 2015 and 2016*

ICT Development Index	Ranking	Value	Average	Country Charts
2015	14	8.11	4.74	
2016	17	8.08	4.94	
Sub-index IDI access	39	7.69	5.58	
IDI use	7	8.18	3.91	
IDI skills	10	8.65	5.74	
2015	1	8.78	4.74	
2016	1	8.84	4.94	
Sub-index IDI access	8	8.99	5.58	
IDI use	3	8.57	3.91	
IDI skills	3	9.08	5.74	
2015	69	5.45	4.74	
2016	70	5.69	4.94	
Sub-index IDI access	81	6.20	5.58	
IDI use	76	4.18	3.91	
IDI skills	39	7.72	5.74	

Current analysis suggests that the ICT index gap between developed countries and high income developing countries is steadily decreasing. This is partially due to greater investment amounts made by high income developing countries by enabling the access to higher broadband speeds and more sophisticated digital services that are more attainable for their citizens. Conversely, the gap between high income developing countries and the majority of other developing countries is widening as they are unable to sustain the same level of investment in technology and ICT services.

In 2016, the percentage of households having computer was 89% in Finland (Table 2.8). S. Korea (77%) and Turkey (56%) were above the world average but had lower percentages than Finland. Although access to computers from home in S. Korea was percentage-wise lower than Finland, S. Korea had 99% percentage of households with internet access (ITU, 2016). Internet access from home in Finland was 89% of households and it was only 70% in Turkey. Moreover, percentage of individuals using the internet was higher in Finland (93%) than S. Korea (90%) and Turkey (51%).

Table 2.8. *ICT status of the countries*

ICT status			Finland	S. Korea	Turkey	Average
Year						
2016	Access to computers from home		89%	77%	56%	46%
	Internet access from home		89%	99%	70%	49%
	Percentage of individuals using the Internet		93%	90%	54%	44%
2015	Number of computers per student		0.79	0.37	0.16	0.77
	Percentage of computers connected to the Internet		80.4%	98.4%	89.3%	96.4%
2012	Students' computer use at school		89%	42%	49%	72%
	Internet use outside of school	Weekdays, mins	99	41	52	-
		Weekend days, mins	130	94	78	-
		Extreme users, %	4.1	0.6	2.5	-

Although ICT is now an integral part of our daily lives, we are yet to see these technologies widely adopted in formal education according to an OECD report published in 2015. Computers and the Internet now play a significant role in both our professional and personal lives. If students are not taught the basic skills of reading, writing and navigating in the digital world, they will increasingly find themselves unable to participate fully in economic, social and everyday life evolving around them.

The report also acknowledges the importance of developing digital skills alongside literacy (OECD, 2015). It remarks high correlation between student performance results in digital reading and both paper based reading and mathematics. Interestingly, S. Korean has excellent access to the internet with all teenage students easily (99%) integrating and using computers in their daily lives, which accounts for why S. Korea managed to score top marks in digital reading despite reporting relatively infrequent use of ICT in school (42%).

PISA 2015 results (OECD, 2016a) show that the highest number of computers per student was in Finland (0.79), while the highest percentage of computers connected to the internet was in S. Korea (98.4%) instead of Finland among selected countries. Furthermore, PISA 2012 results based on students' self report reveal that the percentage of 15-year-old students using computers at school was 89% in Finland (OECD, 2015). Additionally, Finnish students were the ones who use internet heavily outside of school too compared to S. Korean and Turkish students (Table 2.8). Interestingly, the study of ITU explains that the differences observed among the ICT use of countries shall refer to inequality issues in education, wealth and gender (ITU, 2017).

2.3.2. Cases

Cases were defined under seven topics as follows: Educational norms of the countries, educational systems, learning environments, teachers in education system, and assessment strategies of educational outcomes, finance of education systems and educational context of ICTs. Under each topic, individual cases of each country were explained and the comparison table was given.

2.3.2.1. Educational Norms of the Countries

Finnish Case

In the Nordic countries, systematic changes have been taking place in education policy. These countries also have a background mostly in favor of neo-liberalism and today they have become modern countries that value the welfare of the country itself. There has been an increased emphasis on the value of the individual rather than the formerly accepted idea of a collective equality. The omnipotence of central management came to an end in the late 1980's and since 1990; the Finnish national curriculum has increasingly focused on policies of flexibility and decentralization (Rinne, Kivirauma & Simola, 2002) in an effort to provide a more equal, efficient, economic and productive education system. This change in Finnish education policies are now based on; empowerment of local authorities, goal oriented approach, choice, creativity, comprehensive, non-selective, teacher professionalism and shared trust.

The national government through the Ministry of Education and Culture is primarily responsible for setting the overarching education policy and curriculum framework (Pudas, 2009), while The National Board of Education (NBE) is the primary body responsible for assessing and evaluating the education system with the exception of higher education which is evaluated by an independent organization named Finnish Higher Education Evaluation Council (FINHEEC). The core curriculum, however, is not only shaped with the effort of authorities but by the cooperation of unions such as OECD, EU, UN and UNESCO (Pudas, 2009), schools, the board of administrators and education providers while taking the views of parents, educational professionals and society interest groups into consideration (Vahtivuori-Hänninen, Halinen, Niemi, Lavonen & Lipponen, 2014; Vitikka, Krokfors & Hurmerinta, 2012).

At the provincial level, Education and Culture Departments develop and implement individual strategies through local administrators who guide and direct municipality educational providers to meet national standards (Pietarinen, Pyhältö & Tiina, 2017) without a need for separate school inspectorate. The system relies solely on the proficiency of the teachers in their efforts to carry out the objectives laid down in the curricula.

The National framework in essence provides guidance for municipalities and schools, then they form their own curricular regulations with the help of active involvement of teachers and local officials. This provides a level of flexibility to account for and be sensitive to local conditions as well as commitment to the implementation of curriculum whilst still ensuring National requirements are met and addressed (Vitikka et. al, 2012). This also allows teachers the freedom to choose their own pedagogy, teaching methods, materials and even student assessment methods (Morgan, 2014; Vahtivuori-Hänninen et. al, 2014). For example, all textbooks are prepared by private publishers based on curricular needs and they don’t need to be approved by government anymore (Vitikka et. al, 2012). Concordantly, the learning materials which are neither authorized by the government nor supported financially by a public organization are selected over a consensus formed by the schools. Figure 2.4 below represents a summary of the process of curriculum reform and the foundation of basic education and its components.

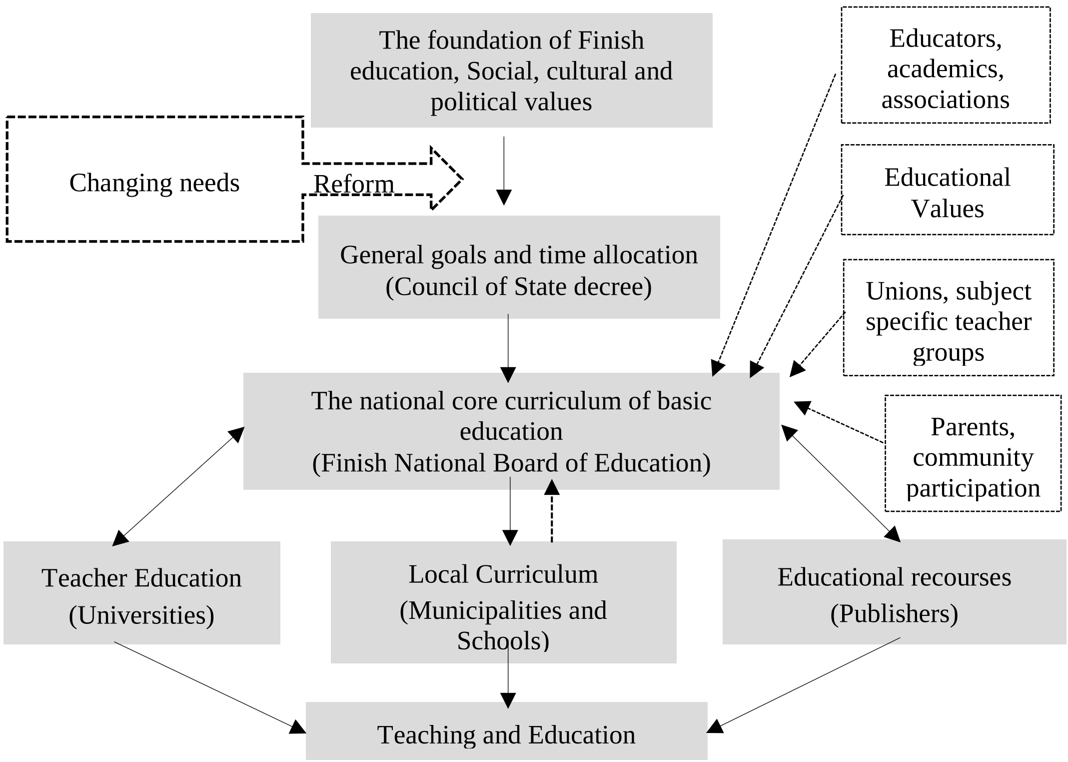


Figure 2.4. Summary of process of curriculum reform and the foundation of basic education and its components

A new national core curriculum was published at the end of 2014 for basic education and local curricula was approved in the summer of 2016 in order to introduce new curricula to all grades for fall semester of 2016. The needs of 21th century skills, the educational role of ICT and the need for new learning environments were the starting point of the reforms to be made in Finish education system for the establishment of new core curricula (Vahtivuori-Hänninen et. al, 2014). Accordingly, technology has been included more into learning & teaching processes for all subjects in order to support the improvement of students' information and communication skills. Moreover, particularly, the new curriculum introduces the fundamentals of programming which is embedded into course objectives of mathematics; in turn, this allows students to learn it in the early years of basic education.

S. Korean Case

The S. Korean education system reflects the character of government that is historically centralized. Major initiatives are produced and funded by a central office and the lower regional offshoots of the central office that carry them out. The national government is responsible for educational system and The Ministry of Education, Science and Technology (MEST) is responsible for the development and implementation of educational policies for primary, secondary and higher education institutions. Thus, all regional offices, metropolitan and provincial offices of education are closely aligned with general policies of MEST.

In the 1990s, with the development of the economy and growth of local democracy, recognition of local autonomy was enabled (Kim, 2014). In 2000s, the emphasis on school policies have evolved into an expansion of school autonomy and decentralization of the education to a local level (OECD, 2010). While the school principals are still in charge of school management, through a school council formed by teachers and parents also had a chance to get involved in school management. But, the local autonomy and regional policies are still limited by the hierarchical relationship between the central government and local administrations as well as great authority of presidential leadership (Kim, 2014).

The education ministry is responsible for administration and financial support for the entire school system; supervision of teacher training and human resource policy; and the development and publication of textbooks in line with curriculum requirements. S. Korean MEST develops and controls the S. Korean national curriculum in line with the equality oriented educational opportunities for all and the provision of a high quality of education. The national curriculum is a framework for educational contents and development of text book happens with the help of regional guidelines. This provides flexibility to individual schools that have specific characteristics and objectives. A new curriculum has been put into practice every 5 to 10 years and there has been a total of 7 curricula in order to adopt changes into culture, needs of society and academic disciplines. The seventh curriculum has been applied since 2000 and went through 3 partial revisions. The latest and the third revision of the seventh curriculum was released in 2015. This version was put into practice in primary school level in 2017 and in secondary school and high school levels in 2018. This version of the curriculum is expected to be in practice until 2020 (Kim & Eom, 2017). The primary purpose of the most recent curriculum is to educate students as global citizens by focusing on the areas of individualism and creativeness supported by the access to global information resources and values (Yi & Kwon, 2008).

Policy research and implementation of the policies, improvement and assessment of the national curriculum are supported by research institutions such as the S. Korean Educational Development Institute (KEDI), S. Korea Education and Research Information Service (KERIS), S. Korea Institute for Curriculum and Evaluation (KICE), S. Korea Research Institute of Vocational Education and Training (KRIVET) and National Institute for Lifelong Education (NILE). For instance, KERIS is responsible for improvement and implementation of the National ICT policies in education by promoting academic research and projects. The major tasks of the institutions are developing e-learning environments, cyber home learning systems and educational digital textbooks, promoting global cooperation and resource sharing, and providing electronic systems such as the National Educational Information System (NIES), National Education Service System (EDUNET), Research Information Service System (RISS) and S. Korea Open CourseWare (KOCW). Among these systems, NEIS as an e-administration service connects all S. Korean schools, government departments, teachers and parents.

Turkish Case

Turkey's education policy is governed in a centralized model by the Ministry of National Education (MoNE) and at the tertiary level, by the Council of Higher Education (YOK). The central and provincial governments are responsible for fiscal and employment management of all schools within their area of responsibility, as such schools have limited control or independence to respond to their own needs. Tertiary institutions are given more autonomy than schools to meet their needs, but still the central government control their funding and tertiary entrance examinations. Due to the strong centralized governance and top-down management system, it can not be assumed that the educational reforms made by the authorities would be completely independent of political climate of the country.

In Turkey, development plans and policies which include educational strategies and performance are regularly documented by MoNE. However, it is unclear whether the changes, which are made very quickly and without taking the results of other changes into account, have a certain pattern and evolving philosophy. The patterns and development of policies are not either documented or accessible as they are in Finland and S. Korea.

The Turkish education system has been undergoing a major structural and contextual change, particularly in the last 15 years. For example, the 8 year uninterrupted compulsory education program, which was enacted in 1997, has changed and characterized by the "4 +4 + 4" formulation, which corresponds to 12 years of interrupted education program in 2012 by the Ministry of National Education. The program immediately implemented during 2012-2013 academic years. As a result of structural reform, the year of compulsory education has raised to 12. Additionally, the compulsory school-starting age has lowered to 69 months old (MoNE, 2017). The new education system has aimed to give equal and higher amount of opportunities to children in order to choose their future professions and discover their interests in early ages which would determine their study fields in universities (Gün & Baskan, 2014).

After the change of educational structure in 2012, the new curriculum, which will be implemented in 1., 5. and 9. grades starting from 2017-2018 academic year, has also been created with 2 years of work of MoNE. At the beginning of 2017, MoNE publicly shared the new draft of curriculum incorporating 53 lessons by uploading it on their official web-page. Stakeholders (such as teachers, parents, academics, and unions) submitted their opinions and suggestions to the MoNE within 1 month duration. The programs would be revised and finalized in line with these opinions by MoNE. In this way, they aimed to have a data-driven and transparent process of curriculum preparation and assessment through the involvement of stakeholders. For the comparison of countries regarding educational norms of countries, see Table 2.9.

Table 2.9. *Norms of the contexts*

Context	Finland	S. Korea	Turkey
Governance	Decentralized	Centralized	Centralized
Education governance arrangements	Locally centralized	Locally centralized	Centralized
Reforms	Active participation	By governmental research centers	Centralized

2.3.2.2. Educational Systems

Finnish Case

Leading principles of Finish Education are based on quality, equality, life-long learning, and efficiency (Niemi, 2014). Correspondingly, Finish basic education (see Figure 2.5) including transportation, textbooks and daily given meals is free and publically funded. There are very few private schools (religious) and none private universities in Finland (Sahlberg, 2014). Public and private schools are not so different due to getting the same government funds, following the same admission standards and curriculum. The form of basic education is the same in every school for each age group.

In Finland, pre-primary education is to prepare children at age 6 for primary level. It is not mandatory, yet attendance is high (Björklund, 2015). Morgan (2014) explains that the comprehensive school (*peruskoulu*, in Finnish language, meaning "basic school") takes 9-years in total and it is designed for every single child in Finland aged from 7 to 16. During the primary level (6 years), a classroom teacher teaches almost all subjects, yet, in lower secondary level (3 years) separate subject matter teachers provide the education. Basic education is completed by over 99% of the students in

Finland. After completing the comprehensive school, 95% of the students chose to go one of the non-obligatory general or vocational upper secondary schools.

Upper secondary school is not compulsory and it is for students who are aged from 16 to 19. Students can switch between general/vocational pathways. At the end of the upper secondly education, students take a national exam to enroll into a university. This national matriculation exam has been gradually transforming to a form placed digital environment between years 2016 and 2019. The Digabi Project is responsible for the adaption and the transformation of e-exams (https://digabi.fi/digabi-en/). There are 18 mandatory subjects included in the scope of basic education (see Table 2.10). The number of subjects that are taken by the students vary based on the grade and optional subjects chosen.

Table 2.10. *Mandatory subjects in basic education (FNBE, 2018)*

Subjects	
• Mother tongue and literature (Finish or Swedish)	• Physics
• The other national language (Swedish or Finish)	• Chemistry
• Foreign languages	• Biology
• Environmental studies	• Geography
• Health education	• Physical education
• Religion or ethics	• Music
• History	• Visual arts
• Social studies	• Craft
• Mathematics	• Home economics
	• Optional studies

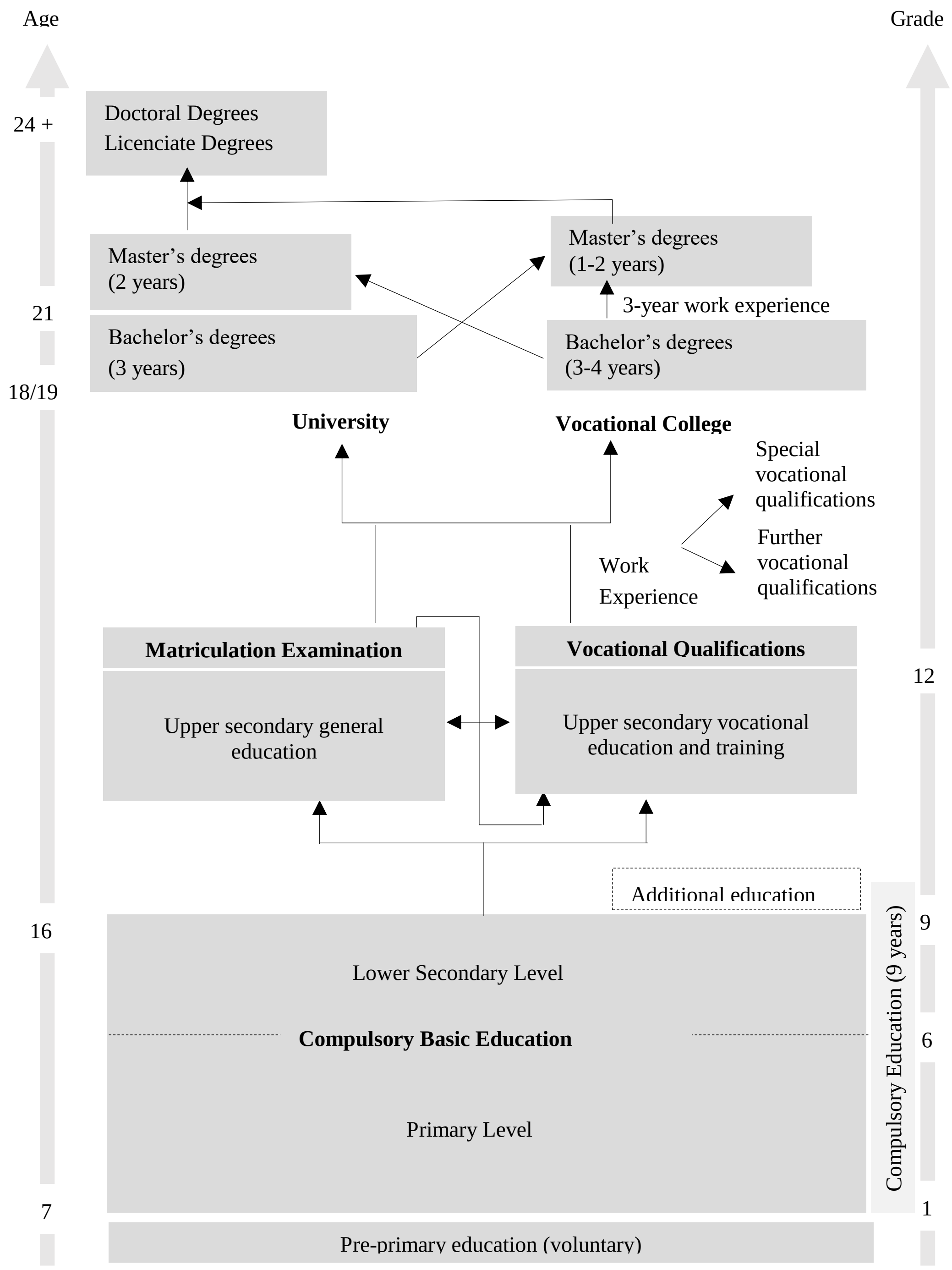


Figure 2.5. Finnish Education System

S. Korean Case

In S. Korea, education has a great cultural and social importance at national level (Vaillant, 2015). Because the importance of education in S. Korean society has been traditionally perceived as correlating it with an individual’s socio economic status and improvement of mind. S. Korean Society views education as a way for individuals to raise their social and economic standing, to foster their mind and eventually to advance nation's development (Kim, Kim, Kim & Kim, 2006). Due to the great importance of getting good education and entering one of the top universities to get a well-paid, safe and prestigious job, almost every parent and student seek for private supplementary education (including after-school programs in private crammers so called *Hagwon*). Park (2013) explains that when public education becomes more centralized, standardized and institutionalized, the demand for private education as an interference grows in order to secure student’s success on a competitive national university entrance exam (a College Scholastic Ability Test (CSAT), a.k.a. *Suneung*).

S. Korean education system follows *‘the 6-3-3-4 latter structure’*: 6 years of elementary school, 3 years of middle school, 3 years of high school and 4 years of university and under graduate school education (see Figure 2.6). Compulsory education makes up for the first 9 years of schooling which only includes primary and middle school. It is also free and designed for students who are aged from 6 to 15. During the compulsory education period, students commonly go to their local schools. As following middle school, students may pick one of the three types of high school education institutions to go: general/academic, vocational/technical or specialist/special purpose high schools. In major metropolitan areas due to equalization policies, the students are assigned to high schools based on a computer lottery system while other regions consider previous academic records of students and result of entrance exams employed by school administrations.

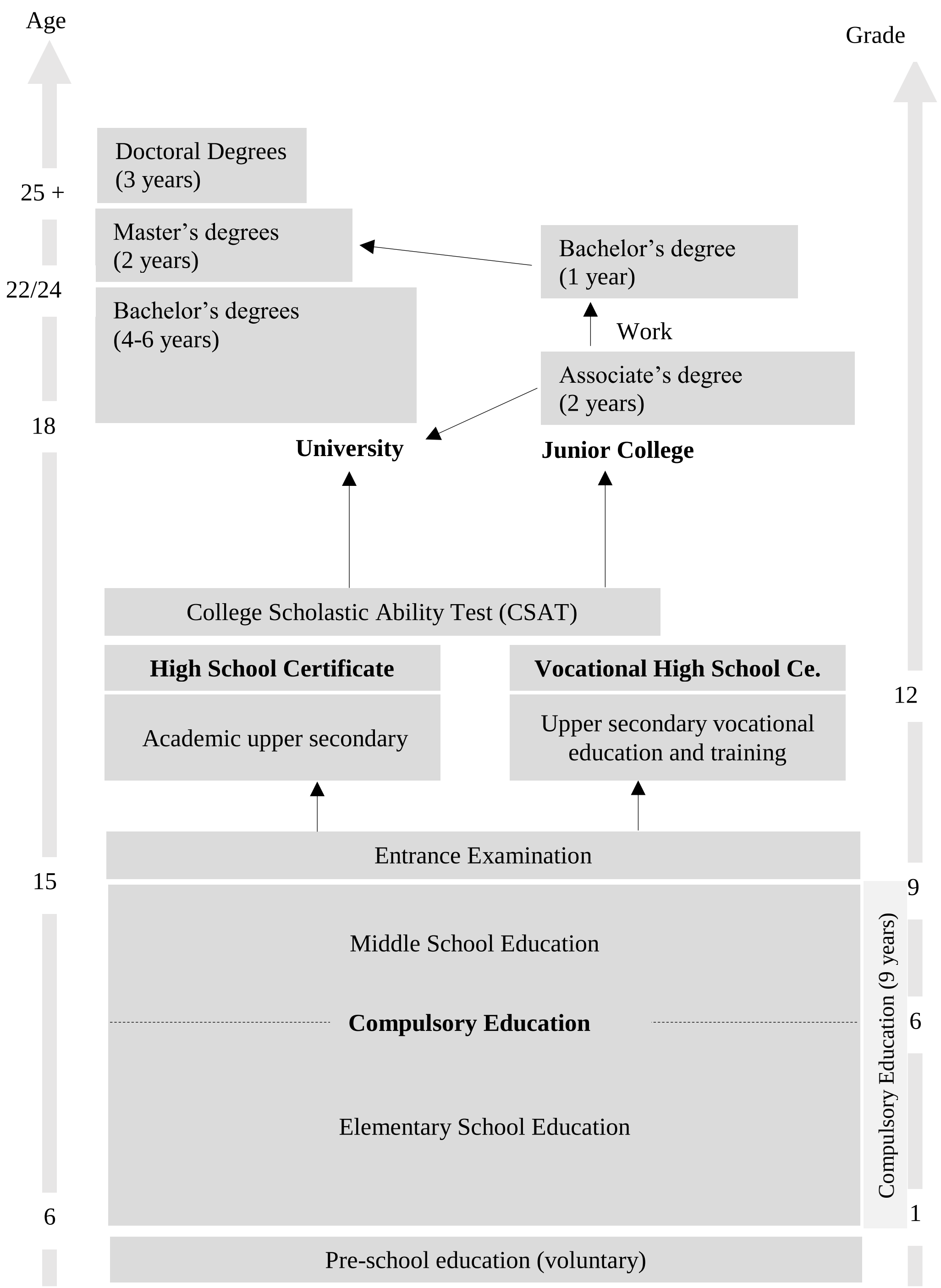


Figure 2.6. S. Korean Education System

At the elementary level, S. Korean language, ethics, science, mathematics, social studies, physical education (PE), music and the arts constitute the core subjects. In middle school, students are grouped based on their abilities in S. Korean Language, English, mathematics, science and social studies (MEST, 2008). But moral education, music, PE, fine and practical arts are not regarded as ability-based core lessons. Moreover, extracurricular and optional courses are also available in middle schools. For instance, home economics and technology are extracurricular courses, while information technology and different foreign languages are optional courses (MEST, 2008).

In the first grade of general/academic high school, there are 10 mandatory subjects (same core lessons as in middle school) and 10 elective courses. When students complete first year of general education, they choose their specialization areas among natural science, social studies or vocational training.

Turkish Case

The compulsory education in Turkey is a "4+4+4" divided system consisting of 4-year primary, 4-year middle and 4-year high school education. Figure 2.7 represents the formal education system in Turkey. A 4-year primary school and a 4-year middle school form the primary education. Primary school attendance is mandatory at age 5.5. Middle school (lower secondary school) education starts at age 9.5 and students are asked to choose their pathways in middle schools. Due to emphasis on vocational guidance which is supported with elective courses throughout the middle school education, diversity in middle schools are provided with the availability of different programs and schools with religious characteristics (MoNE, 2017). Elective lessons in middle and religious middle schools are designed to support high school education of children based on their choices, abilities and development.

Secondary education consists of general, vocational and technical high schools. Moreover, there are different kind of high schools such as Anatolian, science, Imam

Hatip Schools (Religious vocational schools), fine arts and private that offer variety of educational content. Students start high school at the age of 13.5 and they are assigned to high schools based on combined graduation score of middle school and score of Basic Education to Higher Education Examinations (TEOG). Moreover, distance education is an option for high school education.

With the new arrangement in 2012, the basic religious knowledge, the lesson called "The Life of Our Prophet" (changed in new curriculum, 2017) and "Quran" were added to curricula of secondary schools as elective courses (published in the Official Gazette dated April 11, 2012 and numbered 28261). Additionally, while core courses such as Turkish, mathematics, science, social studies and foreign language remain unchanged in middle schools, the government decided to improve the infrastructure for possible elective courses and students' transition from middle school to high school education.

Elective courses in secondary schools are entitled to be received depending on the preference of students and their parents. Thus, the right to choose has been provided and it has been possible to meet the demands of the individuals in order to receive education in accordance with their interests, desires and abilities.

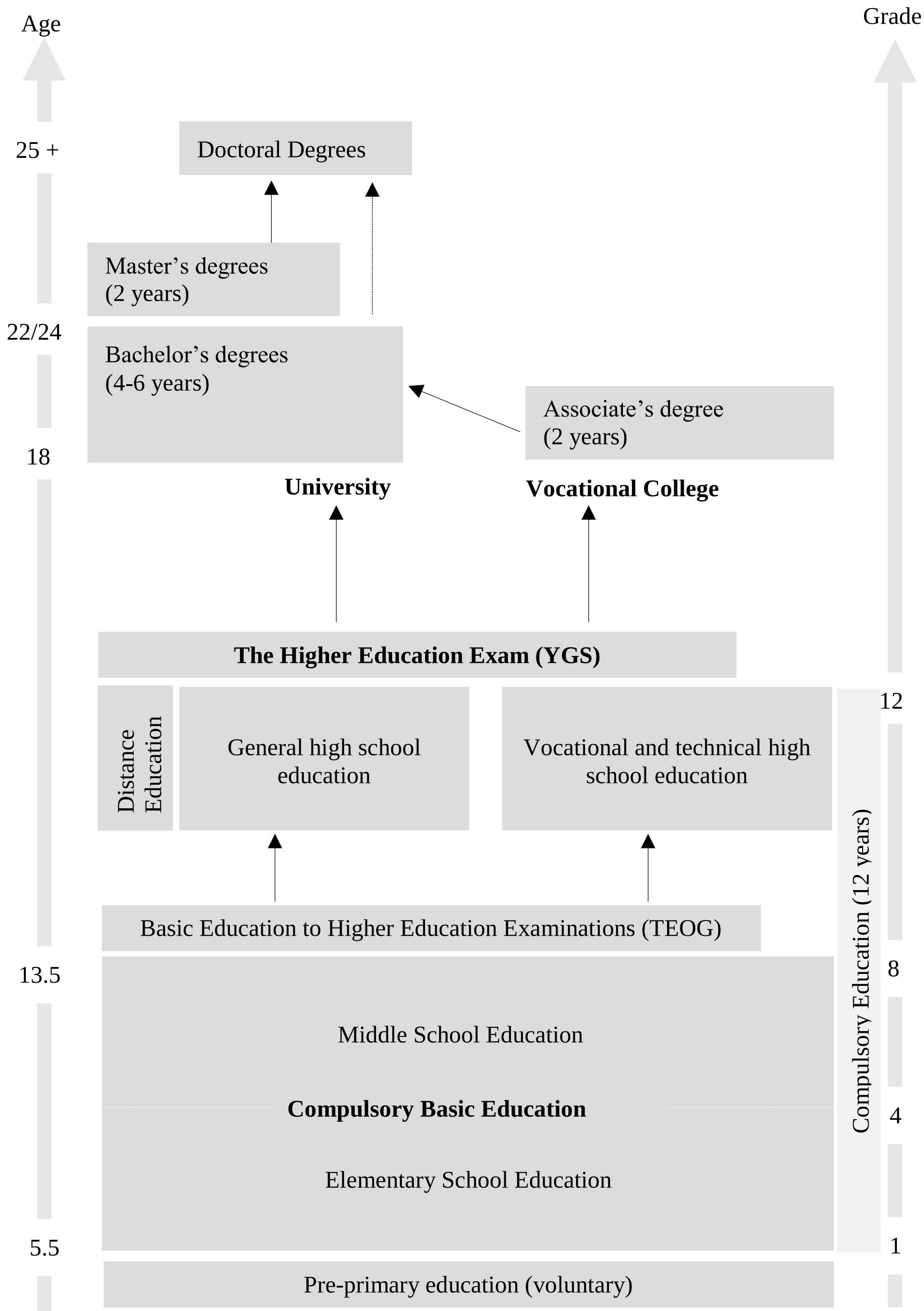


Figure 2.7. Turkish Education System

In Turkey, private supplementary education and their institutions were very common in order to prepare for the exams and the completion of shortcomings in formal education. However, recently, the definitions of private supplementary institutions and the regulations to open these institutions have changed with the decree of law. Private tutoring institutions and study centers were asked to be turned into private schools due to the concerns in educational quality and equality. It was decided to allow to private tutoring institutions that are focused on only one subject area (Turkish language and literature, mathematics, physics, chemistry, biology, history, geography and philosophy) for only high school students. For primary school students, additional free after-school courses are provided and given in schools. Table 2.11 showing the years of education according to each country was provided to facilitate comparison.

Table 2.11. *Years of schooling*

		Finland	S. Korea	Turkey
Duration of Compulsory Education (years)		9	9	12
Theoretical duration	pre-primary education	4	3	3
	Primary education	6	6	4
	Lower secondary	3	3	4
	Upper secondary	3	3	4
	Secondary education	6	6	8
Starting age	Pre-primary	3	3	3
	Primary school	7	6	5.5
	Lower secondary	13	12	10.5
	Upper secondary	16	15	13.5

2.3.2.3. Learning Environments

Finnish Case

According to Official Statistics of Finland (OSF) (2016), the number of active comprehensive schools was 2,449 in autumn 2016. There were 550,200 students registered in the comprehensive schools and 49 percent of the students were female while 51 percent were male. The school year is from August to June, taking 190 days.

In basic education, 20 or less students create a teaching group in a class in Finland (FNBE, 2018). Total teaching time per week in schools varies between 18 to 24 course hours and each lesson takes 45 minutes. At primary school level, compulsory teaching time was 673 hours a year, while it was 589 hours at lower secondary school level in 2017 (OECD, 2019f). Accordingly, teaching hours as the allocated work load on teachers varies based on different subjects. Addition to teaching hours, teachers are obligated to spend 2-3 hours per week for collaboration and planning (FNBE, 2018).

Supporting the students in learning and providing individual guidance are the main objectives of education in Finland. Parents actively interact with schools and teachers have close relationships with students and their parents. Thus, parent involvement and interactive relationships provide common understanding about the curriculum and teaching-learning processes. Grade repetition rate is as low as 0,4 percent among students and students don't study more than 15 hours a week after school (FNBE, 2018). Based on students' self report in PISA 2015, on average, total after-school study time in science, mathematics, language-of-instruction, foreign language and other subjects was 11.9 hours a week for 15 years-old-students (OECD, 2016b). The percentage of grade repeating students in lower secondary general education in all grades for both sexes was 0.37% (UIS, 2016d).

Students are labeled or divided into study groups in the classrooms based on their common interests and goals of instruction determined for them rather than based on their cognitive abilities (Valijarvi, 2004). This approach supports cooperative and active learning. Furthermore, individual support and guidance as well as equality in education give students with special needs an opportunity to study in regular schools. Extra care and help are provided for slow learning students during compulsory education.

Equality concerns are the essence of Finnish education. This means that every single student regardless of their socio-economic background, ethnic origin or age has the right to receive high-quality education and training (Sahlberg, 2012). High quality and equality in education are believed to reduce the achievement gap between high and low performers who are coming from different backgrounds (Sahlberg, 2012; Sarjala, 2013). For example, students in Finland go to the closest school to their home unless a specific course is wanted to taken. This is called non-selective school system which promotes homogeneity in the classrooms (Valijarvi, 2004).

S. Korean Case

The total number of elementary (6001), middle (3232) and high schools (2402) was 11635 in year 2016 (MEST & KEDI, 2016). There were 5 897 985 students registered in these schools and 48 percent of these students were female while 52 percent were male. A school year takes 220 days and it consists of 2 semesters: First semester is from March to August, while second semester is from September to February (Jo, 2008).

In a S. Korean middle school, an average of 32 students form a teaching group in a class (OECD, 2016c). At primary school level, the time spent in regular lessons for instruction was 671 hours per year, and it was 533 at lower secondary school level in 2017 (OECD, 2019f). The length of a class period can be change by a school depending on learning content, development stages of students and changes in weather and seasons (MEST, 2008). However, in general, a designated class time for elementary school is 40 minutes, for elementary school it increases to 45 minutes and for high school, it is 50 minutes. According to statistics of UNESCO Institute, percentage of grade repeating students in lower secondary general education in all grades for both sexes were as low as 0.01% in 2016 (UIS, 2016d).

The scope of the study is not limited to the duration of daytime schooling. In S. Korea, the high number of students (more than 70% of the students) attend after school classes for long hours (OECD, 2012). The total hours of private tutoring may be 25 hours a week including semester breaks and weekends (OECD, 2014). In this case, school-teachers provide 57% of the instructional services while private tutors provide 43% of it (OECD, 2014). On average, total after-school study time in science, mathematics, language-of-instruction, foreign language and other subjects was 20.2 hours a week for 15 years-old-students in 2015 (OECD, 2016a).

Turkish Case

According to Turkish Statistical Institute (TUIK) data which were collected in 2015-2016 academic year, the number of primary schools was 26 522 and the number of students in primary schools was 5 360 703, while the number of middle schools was 17 343 and the number of students in middle schools was 5 211 506. Additionally, there were 5 807 643 students in 10 550 high schools. The school year is from September to June taking 180 days in total.

Turkish schools don't have either a great autonomy over curriculum or control over resources and assessment (OECD, 2015a). Schools in urban areas experience some challenges in education environment such as overpopulated classrooms, insufficient resources and double-shift schooling due to excessive population flow from rural to urban areas (OECD, 2013). On the other hand, schools in rural areas have different challenges such as low female student participation in education, high teacher turnover rate, lower academic achievement and under-populated schools.

According to TUIK education statistics for 2015-2016 academic year, in primary school, 21 or less students create a teaching group in a class. This number rises to 24 for a class in middle school and decreases to 20 for a class in high school. In the new weekly schedule for primary and secondary schools, regular teaching time for a week in schools are increased to 30 hours per week in primary school and 35 hours per week in secondary school (MoNE, 2017). Lessons are for 40 minutes in both primary and secondary school. Additionally, according to OECD statistics, compulsory instruction time was 720 hours at primary school level, while it was 504 hours at lower secondary school level (OECD, 2019f).

The percentage of repeaters in primary education in all grades for both sexes was 2.04 and in lower secondary general education in all grades for both sexes was 2.45% (UIS, 2016d). On average, total after-school study time in science, mathematics, language-of-instruction, foreign language and other subject was 24.5 hours a week for 15 years-old-students. Turkey was ranked as 6th out of 55 countries for spending many hours studying after school (OECD, 2016a). Table 2.12 was created to illustrate the parameters of learning environment in three countries.

Table 2.12. *Comparison of parameters of Learning Environment*

		Finland	S. Korea	Turkey	Average
Average # of students in a classroom		20	32	21	-
Average time spent per year for learning in regular lessons, in hours	At primary school level	673	671	720	767
	At lower secondary school level	586	533	504	705
1 teaching hour , in minutes		45	40,45,50	40	-
Student-teacher ratio in the school		10.30	15.09	15.16	13.06
Percentage of grade repeating students in primary education		0.4	0.1	2.06	-
Hours studying after school		11.9	20.2	24.5	17.1
The school year, in days		190	220	180	-

2.3.2.4. Teachers in Education System

Finnish Case

According to Finnish National Board of Education (FNBE) (2014), students undergo a highly competitive selection process to be admitted to school of education and only about 10 percent of all applicants are approved for teacher education (cited in Niemi, 2014). In table 2.13, the number of applicants taking part in phase 1 entrance test for Finnish-language class teacher education is shared along with the number of selected candidates for class teacher education as a proof of the competitive selection process taking place (FNBE, 2014). The 2-phase selection system is not only based on the national examination, but also the factors such as high school grades, interviews, extracurricular activates, exemplary lecturing and character and suitability of students for being a teacher are considered (Morgan, 2014). If students get accepted, they are entitled to go one of the 8 universities placed in 11 campuses which are not government institutions (Malinen, Väisänen & Savolainen, 2012) but the program is sponsored by the government. Educational requirements for teachers: A Primary school teacher is required to complete a degree majoring in education along with a minoring in curriculum related area. A Secondary or High school teacher is required to complete a degree majoring in the subject they will teach and to do a minor in another subject area. Additionally they are required to complete a five year of education to assure that they have mastered in the profession of teaching. Those who complete the fifth year with success are awarded with a master's degree (Morgan, 2014). There is no option of distance education or open course provision for teacher education. Technology teaching is not a major but instead, it is given as a minor subject to teacher candidates who select, for instance, math and technology.

Table 2.13. *Competitive selection of teachers*

Competitive selection of teachers			
Years	2011	2012	2013
# of applicants who took part in phase-1 national exam	8 856	11 976	12 493
# of applicants chosen for class teacher education	811	879	886

A research-oriented teacher education model with an emphasis on pedagogical content knowledge and practice teaching at teacher training schools that are attached to each faculty of education underlie the teacher education in the faculties in Finland (Sahlberg, 2011). In this regard, teacher candidates are trained as researchers in order to make them gain the ability of following up with the latest studies and implementation techniques regarding the teaching and learning processes. As a result of high level of training and the competitive selection process, a high level of professional autonomy and a trust in teachers are created; in turn, the teaching profession becomes one of the most preferred, respected and satisfying professions (Laukkanen, 2008; Morgan, 2014) even if entrance level salary is not so high compared with teacher salary of other OECD countries provided in Table 2.14 in 2017

(OECD, 2019g). Additionally, starting salary of a primary school teacher for a year is quite below the GDP per head (PPP based) in Finland (OECD, 2019h). The top of the pay scale of a primary teacher could exceed only little bit of GDP per head.

Table 2.14. *Teacher salaries*

Countries	GDP per head (PPP based), USD	Primary, starting, yearly, USD	Countries	GDP per head (PPP based), USD	Primary, Top of Scale, yearly, USD
Luxembourg		70 192.3	Luxembourg		124 035.5
Germany		56 534.7	Switzerland		85 752.5
Switzerland		56 350.8	S. Korea	37 143	84 842.4
Denmark		44 918.7	Germany		75 001.6
Australia		41 798.4	Austria		73 501.4
Austria		40 548.2	Ireland		68 712.3
Norway		39 585.2	United States		67 197.0
Canada		39 222.0	Canada		65 473.8
United States		39 183.3	Portugal		65 416.6
Spain		38 986.7	Japan		63 968.6
Netherlands		38 922.5	Netherlands		61 279.5
Sweden		36 689.3	Australia		59 568.0
Iceland		35 755.9	Spain		55 384.3
Ireland		33 961.9	Average		52 638.6
Finland	43 730	33 408.4	France		52 373.9
Portugal		32 886.6	Denmark		51 505.8
Average		31 058.5	Israel		51 495.5
Japan		30 631.0	Norway		51 209.4
S. Korea	37 143	30 395.1	Sweden		49 587.0
New Zealand		30 254.1	Slovenia		48 166.0
France		29 515.5	New Zealand		46 337.2
Italy		28 513.8	Chile		43 760.3
Slovenia		26 822.7	Finland	43 730	43 450.6
Turkey	26 677	26 218.8	Italy		41 914.3
Costa Rica		23 887.5	Mexico		39 995.7
Chile		23 428.6	Iceland		39 477.2
Israel		20 050.7	Greece		37 698.9
Mexico		19 893.4	Costa Rica		36 720.3
Estonia		19 529.4	Turkey	26 677	33 288.0
Lithuania		19 385.2	Hungary		27 031.2
Greece		19 374.3	Poland		26 636.2
Czech Republic		18 943.9	Czech Republic		24 784.9
Poland		15 599.8	Slovak Republic		21 625.5
Slovak Republic		14 267.1	Lithuania		19 881.5
Latvia		14 251.9			
Hungary		14 226.9			
Brazil		13 971.4			

As local authorities are empowered by decentralized policies, municipalities or often schools have to deal with the employment of teachers. Open positions are announced by them and teachers apply to municipality for open-position (Sahlberg, 2011). Then the school management recruit the eligible ones among applicants. In the same way, principals are assigned by the local municipality for a period of time among successful teachers. Principals are the managers of school budget and they have the duty of teaching as well in some schools. In-class teacher evaluation or establishing authority over teachers traditionally is not among the responsibilities of principals. Instead, teachers are responsible for their own teaching and they do research-based and formative evaluations to improve the teaching and learning process.

Teachers are expected to constantly improve their knowledge and skills as the requirement of educational policy. The emphasis on professional development requires each municipality to provide and finance at least 3-days compulsory teacher learning opportunities annually (Sahlberg, 2011, 2012). However, while most of the courses focusing on pedagogical implementation of curriculum, the number of courses, time-period or type of development courses are all up to teachers and schools. The funds to better the conditions regarding teacher training, the number of courses and the time spent on professional development varies among municipalities and school regions and the government does not have regulations specific to the situation (Sahlberg, 2011). Moreover, since teachers are already graduated with a master's degree, many of them tend to seek doctoral studies in education while teaching at the school at the same time.

S. Korean Case

Due to the implementation of a policy lowering the retirement age, there has been a lot of teachers that have been retired and this has led to a shortage of primary school teachers (Carnoy, Beteille, Brodziak, Loyalka & Luschei, 2009). This situation raised the expectation of getting employed among the teacher candidates, therefore, it has exacerbated the race to be a primary school teacher. Concordantly, primary school teachers are placed in universities according to their score of CSAT which corresponds to top ranking students within a pie of 5% (Auguste, Kihn & Miller, 2010). However, the situation is slightly different for the selection of secondary school teachers. Because only 20% of the graduated students can become teachers in secondary schools based on "Teacher Employment Test" (Auguste et. al, 2010), while most of the primary teachers can find a position in public schools. So, the secondary school teachers face with a race right after graduation, not when they are trying to get into the university.

Unlike Finland, S. Korea provides departments for computer teacher education, which are placed under education faculty. Elementary and secondary teacher education institutions are not connected but operate independently. There are only 13 institutions designed to train elementary school teachers including 1 private university, 2 national universities and 10 national universities of education (Im, Yoon & Cha, 2016). The universities offer 4-year license degree programs for elementary teacher education. On the other hand, there are several ways to become a secondary school teacher. One way is to graduate from a college of education or get a degree in the field of education from another university (Jo, 2008). However, there is another way for non-collage of education graduates to become a secondary school teacher. They need to receive teaching certificate by taking either teacher preparation courses in general universities or getting a Master of Arts degree from a graduate school of education (Jo, 2008; Kim, Kim & Han, 2009).

Both elementary and secondary school teachers must pass the national teacher employment test to became a teacher in public schools. This test is conducted each year by the S. Korea Institute for Curriculum and Evaluation and each Metropolitan/Provincial Offices of Education. The offices determine the number of teachers needed annually and makes recruitment according to the test result order. Although the recruitment process of teachers for private schools slightly varies and occur independently, scores received from the national teacher employment test is still requested by the schools (Im et. al, 2016).

The teaching is a respected profession in S. Korea and it is a good career choice with a permanent job opportunity, high salary and good working conditions (OECD, 2014). Teaching profession is highly preferred by young people, because the teaching profession is respected by their parents and has a high status in society as well (Auguste et. al, 2010). Starting salary of all teachers dramatically increase by years of experience and the gaining of maximum possible qualifications. For instance, in 2017, the top scale salary with maximum qualifications was 2.8 times more than the starting salary which was much higher than average raise in teacher salary in OECD countries (see Table 2.14). Additionally, salary of primary teachers for top scale was higher than GDP per head (PPP based) for S. Korea in 2017.

In S. Korea, amount of teaching hours in the classroom is relatively lower than many other OECD countries, but teachers spend plenty of time in school for planning classes and doing administrative works (OECD, 2013a). In primary and secondary schools, shared teacher offices promote collaboration among teachers and increase participation in school activities (OECD, 2014). Teachers are accountable for their students' results. However, teachers don't like the idea that they are judged by the results of their students rather than their teaching ability. Moreover, teachers are expected to maintain high levels of social and academic standards. Immoral and criminal behaviors of teachers are severely condemned by the public (Kim et. al, 2006).

Annual teacher evaluations is a key component of the S. Korean education system. All teachers independent of their contract status or institution they work at (primary, secondary, public, private) are evaluated regarding both their performance and their specialty. This annual process is central to improving learning environments and outcomes for students and is conducted at the school level, following strict rules and processes determined by the Ministry of Education and municipal education offices.

PISA 2012, notes that 85.3% of S. Korean schools used student assessment results (a component of the above teacher evaluation process) as means to make judgements about teachers' effectiveness compared to an average of 50.4% across schools in other OECD nations (OECD 2016c).

S. Korean government put emphasis on teachers' professional development as well as improvement of their morale. Teachers must receive in-service training at the beginning of their career (Carnoy et. al, 2009; OECD, 2014). In addition, further certification programs and voluntary trainings are also prominent in teacher training. That's because the certifications play an important role to become a master teacher, a vice-principal and to be promoted to a principal based on performance evaluation, while voluntary trainings support knowledge sharing and spreading knowledge (Jo, 2008). Moreover, teachers are encouraged to take initiative by doing research in the classrooms to solve their own problems with the help of each others experiences (OECD, 2014). The trainings are provided by central and provincial government institutions, university affiliated institutions, private training institutions and institutions providing distance professional development courses.

Turkish Case

According to YOK's statistical data, in Turkey there are 73 Faculty of Education at state universities and 14 Faculty of Education at private universities (YOK, 2018). Based on the result of The Higher Education Exam (YGS), students are entitled to make a choice among all universities and departments available. In Turkey, there are major departments which provides education for computer subject teachers as secondary education.

After the structural changes in 1997-98 and modifications related to programs and the dysfunctional side of the model in 2006-07, teacher training system in Turkey can be explained as follows (YOK, 2007): Faculties for classroom and subject teachers training in the field of primary education consist of 4 year undergraduate programs.

Subject teachers (Art, Music, Physical Education, and Foreign Language) who are able to work in both primary and secondary education and teachers who teaches vocational courses at vocational and technical education institutions also have to take 4-year undergraduate programs. However, the programs for secondary school teachers in the education faculties are designed as 5-year graduate degrees. Moreover, graduates of the department of literature, the faculty of science, science and literature faculty, faculty of theology and the faculty of physical education and sport sciences can be a subject teacher in secondary education institutions by completing a 1.5-year pedagogical formation program as a non-thesis master's program in the relevant institute of the universities (4-year field-specific courses, 1.5 year pedagogical formation courses). The result of Academic Personnel and Graduate Education Exam (ALES) and the graduation grade average are taken into consideration for student acceptance to non-thesis postgraduate programs.

While recruitment as a teacher in a private school is possible with the school's own exam and interview after graduation, teacher recruitment in a public school is based on the supremacy of scores obtained in the Selection Examination for Professional Posts in Public Organizations (KPSS), a highly competitive central exam (Kilickaya & Krajka, 2013). The subjects covered by the exam vary according to the demanded type of teachers. Teachers are recruited for public schools only once a year like following the end of the school year.

Assignments of teachers to the schools are carried out electronically by taking into account their preferences and KPSS score superiority within the announced quotas. They are assigned to schools as candidate teachers at first. In line with the provisions of the Ministry of Education Regulation on Teacher Appointment and Relocation which is published in the Official Gazette dated April 17, 2015 and numbered 29329, candidate teachers are required to work for at least one year and to be successful according to performance evaluation, then they shall be entitled to enter the written and/or oral examination to be conducted by the Ministry of Education. The candidate teachers who are successful in the exams are appointed as teachers by the governorship. Candidate teachers who does not succeed in the exams are assigned to another educational institution in the same service area within the province and in one year they are again re-assessed and tested. In this context, those who failed again in the performance evaluation or examination of candidate teachers lose the title of teaching and are dismissed as a civil servant.

Turkey is one of five OECD countries that steadily increases teacher salaries. Teachers in Turkey, however, receive wages below the average of many developed and the OECD countries (See Table 2.14). In addition, wage increases in teacher salaries based on experience in Turkey is relatively low compared to many other countries (OECD, 2015a). However, In Turkish case, the highest salaries of teachers are above the GDP per capita of Turkish people (see Table 2.15).

Table 2.15. *Teachers in Education System*

	Finland	S. Korea	Turkey
Required top ranking percentage	5%	10%	-
Education period	5 years (including master degree)	4 years	4 years
Recruitment	Exam + Interviews	Exam	Exam
GDP per capita, USD	43 730	37 143	26 677
Starting salary for primary level	33 408	30 395	26 219
The highest salaries for primary level	43 730	84 842	33 288

2.3.2.5. Assessment Strategies of Educational Outcomes

Finnish Case

At the national level, Ministry of education arrange sample-based assessments and prepare reports to inform policy-makers about the current status of education (Niemi, 2014). The results of international assessments such as PISA also helps them to understand the outcomes of educational practices. Additionally, national assessments which are employed only in 9th grade also act as an indicator of the development of education (Niemi, 2014). At local level, internal and external evaluations are developed by authorities in order to improve education in relation with core curriculum. Educational arrangements of neither schools nor institutions are controlled regularly by an inspection (Niemi, 2014); instead they evaluate themselves annually (Laukkanen, 2008). In this context, the national evaluation system as a tool for improvements aims to assist education administration at local level and support the development of schools by providing information about current status of education system.

Sample-based national assessments that start at 2nd grade do not cover the whole age group since the purpose is to use the results for development of education in a formative manner (Laukkanen, 2008; Niemi, 2014). This assessments include the evaluation of the performance of individuals within the determined sample in lessons and background of these students. The results are used to evaluate the whole system, effects of the reforms, quality of education and schools by the educational authorities. Also, the results are sent to school administrations individually in order to give feedback which promotes self-evaluation of teachers, students and the process of teaching and learning (Laukkanen, 2008). The sample based national assessment is practiced on randomly selected schools and these schools get the results individually because the list of schools and their performance are not published publicly in order to avoid damaging the trust shown for the teachers and the schools (Rinne et. al., 2002, Laukkanen, 2008).

There are no standardized tests until the national matriculation examination at comprehensive schools in 9th grade. This national exam determines students' eligibility for graduation and university application. This open-ended assessments is also for monitoring the development and quality of education in order to support and improve learning once again (Morgan, 2014; Niemi, 2014).

In Finland, there are a few external accountability practices rather than many external standardized tests to determine the success of students (Morgan 2014, Sahlberg, 2011). Sahlberg (2011) explains the reasons as follows: Learning is personalized and a student can only be compared with himself. Policies, curriculum and schools put emphasis on the learning process rather than the evaluation of it. Teachers are responsible for learning of the students and the whole teaching process, so they spend more time outside of the classroom to be prepared for the lessons, curriculum-based assessments and collaboration with collogues rather than practicing an intensive teaching. Students are encouraged to gain self-regulation and self-assessment skills to monitor their own learning process. Hence, frequent testing and stronger accountability which create competition, categories and stress are not useful tools to support students' learning. Instead, teachers and principals are responsible for the evaluation of students' learning process (Niemi, 2014).

The main strategy of establishing welfare across the state emphasize educational quality and cooperation which are already rooted within Finland's social values (Morgan, 2014; Pietarinen et al., 2017). As a result of the establishment of the equality, the idea of standardized testing has not been adopted in the classrooms as well. In this regard, Finland empowers students to find their own way of accomplishing objectives of the curriculum with the guidance of teachers and help of descriptive feedback regarding their individual status (not numerical grade) and their learning process rather than creating a competitive environment, feelings of fear or stress during the learning process (Sahlberg, 2007; Morgan, 2014; Pietarinen et al., 2017).

S. Korean Case

Education system and policies are actively reviewed based on international and national assessment methods, governmental changes and problems arising in the system. S. Korean assessment and evaluation system in education is determined by MEST and the applications occur at municipal and school levels. In other words, evaluation of educational effectiveness is structured in a layered manner so that MEST is responsible for assessing it at the municipality level, whilst municipalities are responsible for assessing it at the local level.

At national level, National Assessment of Educational Achievement (NAEA) is conducted annually by KICE to investigate the quality of education and inspect the curriculum adequacy (Kim, Lee & Kim, 2016). All schools are obligated to take NAEA for the grades of 9 and 11 (OECD, 2016c). As this tests aim to improve curriculum and teaching-learning methods, the results are used for only informational purposes and students don’t receive the results. However, all students’ achievement is based on the CSAT (College Scholastic Ability Test), which is taken to continue with higher education.

The importance of education and the value of high academic achievement in society increases the pressure put on students and creates the anxiety. Students start studying for CSAT in early academic years and they tend to study for long hours out-side of the school due to competition and seeking for high levels of achievement in the exams. Thus, recent educational policies start considering not only academic achievement but happiness of students and enhancement of creativity by decreasing the examination related pressure for students (OECD, 2016c). For instance; to lower the exam related stress experienced by the students, the performance of students are measured based on not only CSAT scores but also by looking at “School Records of Students” which contains information about the detailed academic performance of each student. These records, which include grades for each subject, attendance, physical and moral development of students, extracurricular activities, details of awards and accomplishments, are formed by teachers who regularly assess the students.

Turkish Case

The evaluation and assessment of Turkish education system are done by MoNE under the Basic Low of National Education. The Board of Education evaluates the education system by preparing curricula, setting the necessary criteria and guidelines. Moreover, some surveys are conducted by the Board of Education in order to collect descriptive data that enables making comparisons among schools and regions for developing new policies. The Ministry of National Education Information Systems (MEBBIS), which is an e-school web application, also serves the purpose of data collection from schools since 2002-2003 academic year. International student and system evaluation studies such as PISA is also taken into consideration by MoNE. The results of studies mostly turned into performance reports to improve educational outcomes.

The Turkish education system has a centralized management structure, which is in accordance with the characteristics of the country administration. Similarly, the inspection system of the Turkish education system is structured in a similar way too. Some legislative amendments related to evaluation system of education were made with the Decree on the Organization and Duties of the MoNE in 2016. Instead of inspections done by ministerial inspectors at central level and the independent provincial school inspectorate at the local level, the evaluation and the audit of schools are to be carried out centrally by the Board of Inspectors under the directives of MoNE in 2017-2018 academic year. While the schools are evaluated for compliance with the regulations by inspectors, teachers are assessed based on standards for teacher competence by school leaders under the guidance of inspectors.

The quality of teachers and students is determined according to student evaluations. Exams are held to rank and place the students. Standardized tests are need to be taken for both secondary and higher education. According to "Enhancing the Quality of the Education System, Specialized Commission Report" published in 2014 by Turkish Ministry of Development under the Tenth Development Plan (2014-2018), one of the main reasons why Turkey can not improve the quality of its education system is that the current measurement and evaluation tools are not used sufficiently. In other words, under the current education system, existing measurement tools such as the Turkish National achievement tests (Student Achievement Determination Exam (ÖBBS) and TEOG) and international achievement tests (PISA, PIRLS, and TIMSS) are not used effectively to analyze and determine the indicators of skill acquisition failures being experienced by the students. Therefore, examinations and evaluation studies are basically done only for ranking and handling the placement of students into schools and colleges.

2.3.2.6. Finance of Education Systems

Finnish Case

The education in Finland from pre-primary to higher education is free and it is almost completely financed by public funds. Parents rarely need to provide any financial support for the education of their children. Extra financial support maybe required for only the extracurricular activities or such. Otherwise there is no extra schooling after mandatory classes or private lecturing to help the learning (OECD, 2014).

Federal government, in accordance with the principle of equality, calculates the budget that will be allocated to municipalities based on the number of students aged from 6 to 15 year old living in the region ("Finnish Education in a Nutshell", 2017). Therefore, the size of the funds vary from municipality to municipality and school to school.

Municipalities and schools are responsible for the management of their own budget, but the extent of financial autonomy owned by schools is determined by the municipalities. Because, municipalities decide how much power the school would have in terms of the management of their funds. Teachers and other stuff are also involved in the decision making process especially about learning materials and text-books to be bought by the school (Niemi, 2014).

S. Korean Case

S. Korean education system consists of public and private institutions which receive funding from the government. The funds provided for education come from central and local government resources as well as the recourses owned by schools. Investment rates in educational institutions at all levels of education in S. Korea is above the OECD average (OECD, 2016c).

The greatest financial resources of schools consist of a share of state budgets and student tuition fees which are taken by both public and private schools even if compulsory education is free (OECD, 2016c). For instance, 80% of the pupils are attending to private institutions and tuition fees make up for the more than 40% of the budget allocated for education in S. Korea (OECD, 2016d).

Private education participation rate was as high as 70.5 % in 2017 in S. Korea (KOSTAT, 2018). At all levels of education, from primary school to tertiary education, the share of private funding exceeds 30% of the total amount of private and public funds in S. Korea (OECD, 2016d). This amount is very low as less as 5% in Finland. Moreover, the money spent on supplementary tuition still remains very high.

Turkish Case

Education in Turkey is publicly funded however this can be subsidized through parent association contributions. The government finance the educational reforms with the help of contribution of international, non governmental organizations and private institutions.

Even if the total amount of funding for education has increased in last years, it is still not adequate for primary and secondary education when compared to other OECD countries. Moreover, again among OECD countries, the proportion of GDP spent on public education expenditures from primary to tertiary school level in Turkey was one of the lowest (3.8%), whilst Finland was one of the highest (5.6%) in 2016 (OECD, 2019i).

Public funding is centrally allocated from the national budget to public institutions and private education institutions by the government. Thus, schools have little authority over the management of the budget. Due to limited control of schools over the budget, they face difficulties in responding their changing needs over time. Primary, middle, private special education and open high school books are funded by government. The distribution of free course books in Turkey is seen as one of the applications favoring the provision of equal opportunity and equality in education.

2.3.2.7. Educational Context of ICTs

Finnish Case

In as early as early 1980's, constructing an information society (IS) was an already proposed ideal in Finland by the Information Society Advisory Board (1976-1991) (Chatrie & Wraight, 2000). In the 1990s, computers and connection to information networks were already available in the Finish schools and institutions with the help of growing support of government (Niemi, 2014). Educational use of ICT was supported by government and was included in the curriculum to provide empowerment for the establishment of a strong IS.

The first specific national strategy concerning IS establishment was published in 1994. "Finland -Towards an Information Society, A National Outline Programme" was defined by Ministry of Finance in 1994 and approved in 1995 (Tapper, 2000). First strategy was focused on networking technologies. Development in technology and its use became the keystone in achieving economic growth. Over the following years, action plans and reports were published regarding the implementation of this strategy (see Table 2.17). In 1997, the Finnish National Innovation Fund (SITRA) renewed the strategy and published it in 1998 under the name of "Quality of Life, Knowledge, and Competitiveness" as a second national strategy for information society (SITRA, 1998). With the acceptance of the second strategy, many projects such as JUNA (The e-government project), e-learning, content industry, and teleworking had been launched (Chatrie & Wraight, 2000).

The second strategy put more emphasis on society and culture. It also brought citizens a more central position in ICT-focused development and economic growth. Knowledge was the foundation of Finnish economic competitiveness, however, knowledge and education constituted the foundation. ICT was used as a tool to increase work and welfare, to improve competitiveness and entrepreneurship, and at the same time to strengthen equal opportunities in democracy and society. Not surprisingly, NOKIA's development coincided with this time (Tapper, 2000).

Between year 1996 and 1999, Ministry of Education enabled schools to purchase computers, provided information networks, advertised about ICT use in education and supported related in-service teacher training with the help of Information Finland Program (Jones, 2003). "Education, Training and Research in the Information Society: A National Strategy for 2000-2004" was published by Finnish Ministry of Education in 1999. This strategy aimed becoming a leading country by 2004 as a society based on know-how and cooperation set (Chatrie & Wraight, 2000). It could be achieved by providing a wide range of information resources and training network for the acquisition of necessary skills and knowledge. The strategy was constructed on previous information strategies between 1995-1999 and 2000-2004. Additionally, it was designed to be complementary for the Ministry of Education Strategy 2015 and the 2003-2008 Education and Research Development Plan.

Implementation of 2003-2007 Government Information Society Programme speeded up the development of an information and knowledge society by enhancing cross-sectoral cooperation and increasing the welfare and quality of life of the citizens (Knight & Routti, 2012). This program and a follow up of the National Information Society Programme (2007-2011) improved e-government policies and helped to build a comprehensive information society (OECD, 2010a). A new National Knowledge Society Strategy (2007-2015) for "A renewing, human centric and competitive Finland" was developed in 2006.

The earlier policies related to ICT integration set by the government already provided the infrastructure supporting the ICT use in the classrooms with internet networks, computers and tablet PCs. Thus, the focus of the ICT policy has mostly shifted towards production and use of technology such as content production, using information networks and integrating technology into teacher training. However, in schools, there is not a separate subject as ICT. It is integrated into subjects and use of ICT is left to teachers' own methods employed during the lessons. These developments and related ICT are summarized in the Table 2.17.

In the new curriculum, which has been implementing since 2016, programming takes a place in both general ICT competence and mandatory subjects: Mathematics and craft (see Table 2.16). The integration of programming starts as early as at first grade in mathematics and third grade in crafts. Specific ICT competencies are set for grades 1-9. Students begin their ICT learning continuum by being introduced to age-appropriate programming and progress through understanding how human input effects programming outcomes and eventually culminate in developing coding skills that are enhanced as part of multiple school subjects.

The programming in Mathematics focuses on developing and improving students' algorithmic and computational thinking skills through 1st to 9th grades gradually. Students write simple code strings first, then generate their own codes in visual code programs and, finally, they learn how to implement basic algorithmic thinking strategies while computing simple programs. Moreover, students work on functions in order to program or automatize robots in grades 3-6 as part of craft lessons and start learning how to design and produce products by programming embedded systems in grades 7-9.

Table 2.16. *ICT competence and mandatory subjects in compulsory education*

Grade	Category	Subject	Learning Objectives
1-9	Mandatory course	Mathematics	• Writing simple code strings • Generate their own codes in visual code programs • Implementation of basic algorithmic thinking strategies while computing simple programs
3-6		Craft	• Working with functions in order to program or automatize robots
7-9		Craft	• Start learning how to design and produce products by programming embedded systems

Table 2.17. *Educational Context of ICTs in Finland*

	Information society development policies	Responsibility	Establishment Year	Period	Strategies	Establishment Year	Period	Vision
1	National Outline Policy for the Development of Information Networks	Ministry of Transport and Communication	1994	1995-1998	The National Strategy on Education, Training, and Research Information Finland Program	1995	1996-1999	The National Board of Education financed the five week in-service Finnish Information Society training programme for personnel employed in schools and colleges starting from 1996.
	Finland -Towards an Information Society, A National Outline Programme	Ministry of Finance	1995	1995-2000	An initiative titled Toward a Culture-Oriented Information Society	1996		
2	Quality of Life, Knowledge and Competitiveness	SITRA-Finnish Innovation Funds	1998	1998-2005	Education, Training and Research in the Information Society: A National Strategy	1999	2000-2004	The Finnish school network service Edu.fi Electronic Learning Content Industry The local ICT strategies in education were integrated into curricula (2002).

	Information society development policies	Responsibility	Establishment Year	Period	Strategies	Establishment Year	Period	Vision
								Digital Content Production - Strategic aims and action, 2003
3	Government Information Society Programme	Information Society Council	2003	2003 - 2007	Ministry of Education, Strategy 2015	2003	2003-2015	
					Information Society Programme for Education and Research	2004	2004–2006	
					Ministry of Education, Development Plan for Education and Research	2003	2003-2008	
4	A new National Knowledge Society Strategy	Ministerial Group on the Information Society Program	2006	2007-2015	National Information Society Programme	2006	2007-2011	Ubiquitous information society & e-government, 2007-2011
					Ubiquitous information society Action Plan	2008	2008-2011	

S. Korean Case

In the 1980s, S. Korea was making policies to increase competition in the communication industry. In addition to this, the government began to digitize governmental data and introduced computers to the state offices. In the 1990s, stable and strong policies for information society was incrementally produced. Up to now, 6 master plans have been implemented for S. Korean national informatization (see Table 2.19) (Kim, Jeong & Park, 2015).

In S. Korea, in 1988, ICT implementation in education was regarded as a national policy (Ekici, & Yılmaz, 2013). After this date, various reforms have been carried out within the process of improvements in education. The major educational reform for K-12 to meet demands of an information society was made in mid-1990s under the leadership of ex-president Kim Young-sam. He created a master plan for an education reform which is now referred as the 5.31 Education Reform Proposals (ERP) (Pang, Reinking, Hutchison & Ramey, 2015). One of the policy actions which was recommended by the ERP is “integration of ICT into the lifelong education system to expand educational opportunities for all” (Kim, 2002, p. 37). As a result of ERP policies, S. Korean government has established several master plans to develop and enhance an information and a knowledge society (see Table 2.19) (KERIS, 2014). All national informatization plans has helped S. Korea to have advanced information infrastructure, digital public services and a growing ICT industry.

Between 1996 and 2000, first master plan that aimed at increasing the ICT competencies of students and teachers was put into practice. In accordance with this plan, the number and the quality of equipment available in schools were increased, textbooks consisting of multimedia educational materials were accepted, and content development guide and service system was prepared by KERIS. Within the plan, teachers were advised to use ICT in at less 10% of their time during lessons (S. Korean Ministry of Education, 2000). In years 2001-2005, second master plan that emphasizes application of ICT in the education was implemented. Immediately afterwards, a more progressive plan covering the years 2006-2010 was prepared and employed as the third master plan. This plan covered 6 important points: Improvement of educational infrastructure, development and dissemination of educational information, strengthening of ICT practices in education, improvement of education management, development of academic and research base and development of academic information database (KERIS, 2007). In order to implement educational ICT policies during the time period of third master plan, e-learning services such as EDUNET and RISS and also ubiquitous learning environments were promoted, e-textbooks were commercialized, e-learning standards and quality management services were strengthened, e-learning content was prepared for the process of exporting to other countries and research and development activities was improved (KERIS, 2014).

Forth master plan for ICT in Education, Science and Technology (2010-2014) was announced by Ministry of Education, Science and Technology (MEST) in 2010. SMART education (2011-2015), use of digital textbooks and online classes were promoted in the implementation period of the strategy (MEST & KERIS, 2011). With the help of the strategy for SMART education, an educational innovation with ICT in order to foster acquisition of 21st century skills was aimed. In this context, SMART stands for "Self-directed, Motivated, Adaptive, Resource-enriched, Technology embedded learning methods" (MEST & KERIS, 2011, p. 17). To construct a SMART education environment, advancement and implementation of e-textbooks, activation of online courses and establishment of online evaluation systems, encouraging the use of educational contents for public purposes, strengthening education of ICT ethics for the elimination of ICT-related social issues, improving the skills of teachers for implementation of SMART Education and forming the basis of cloud-based education services were the tasks determined to be realized.

Currently, latest and fifth master plan is under implementation since 2014. The goals of this master plan is to create a blueprint in educational informatization, developing medium and long term projects in order to comply with economic, social, technological and educational changes and promoting global competitive power of S. Korean education system (KERIS, 2014). To accomplish these goals, a creative and competent education is emphasized.

In S. Korea, in line with educational reforms and related policies, computer education was started in 1970s in vocational schools as part of 3th National curriculum out of 7 (KERIS, 2014; Choi, An & Lee, 2015). The first computer lesson as a separate subject was included in the curriculum of secondary education in order to educate pupils in accordance with the need of developing industrial society in 1981 with the introduction of the 4th curriculum (Yi & Kwon, 2008; Choi, An & Lee, 2015). In 1987, computer education was included in 5th curriculum as a part of technology subject for all level of schools. In elementary schools, 5th-6th grade students learn ICT related content within practical arts lesson rather than an independent lesson since 1987. In 1992, “computer education” became an independent subject for middle school students and a course named “information society and computer” was included into 6th curriculum for high schools (Choi et al., 2015). In 1997, with the implementation of 7th curriculum, acquisition of ICT skills was not limited to only specific lessons such as Practical Arts, Technology and Industry and Computers but it was also blended within all school subjects (KERIS, 2014). In 2007, the contents and names of information-related subjects were changed by revision of the curriculum. The latest information-related curriculum was finalized with a 2009 revision. The learning objectives of “informatics education” and features of the course in the 2009 Revised National Curriculum are presented in Table 2.18 below (Choi et al., 2015; Kim et al., 2015; KERIS, 2014, 2015).

Table 2.18. *Information-related lessons for Elementary, Middle and High Schools*

Classification	Grade	Category	Subject		Learning Objectives
Elementary School	5–6	mandatory course	Practical arts	12 in-class hours out of 140 hours	• Developing real world literacy skills through practical experience • Creative thinking and problem solving with the help of information literacy
Middle School	1–3	elective course	Technology & Home-economics Informatics	-	• Comprehend the primary principles of computer science technology • Ability to use computational thinking to solve complex problems. • Promoting information ethics
High School	1–3	Advanced elective course	Informatics	-	• Same competencies in middle school informatics
	1–3		Information science		• Embrace and evolve with rapidly changing knowledge and information • Developing skills to effectively use human resources in computer science, science and mathematics fields

In 2015, another curriculum revision was made in the curriculum of Converged Liberal and Natural Science for all grades in order to include “Software (SW) Education” (KERIS, 2014). Based on the revision, SW education will be integrated into not only computer subject but also into regular subjects at elementary and secondary schools gradually in order to improve computing skills of students at early ages. In elementary schools, SW education would be integrated into Practical Art lesson (Technology, Home Economics) and the in-class teaching hour will be increased from 12 hours to 17 hours. Practical Art lessons will include problem solving strategies, algorithms, programming skills and information ethics by 2019 (KERIS, 2015).

Middle schools will include at least 34 hours of teaching of simple algorithm development and basic programming and the calculation of thought process for solving problems by modifying information lesson as a compulsory course. In high schools, the category of information lesson will be changed from advanced elective course to general elective course and the lesson will cover 32 hours in-class SW education oriented teaching and learning process.

Information-related content is allowed to be taught in Practical Arts for elementary schools, which is a regular subject. In addition, information technologies and information ethics education is selected as the themes for the Cross Curricular Learning in purpose of an integrated education throughout the overall educational activities including any relevant subjects and the Creative Experimental Activities. The educational content in elementary school has focused on using productivity tools such as word processor, spreadsheet, presentation, etc. rather than teaching programming, algorithm and computational thinking. However recently, S. Korean government presented guidelines for software use in education. Its plan intends to teach basic knowledge of software programs such as how to do coding and how to develop programs.

Table 2.19. *Summary of national and educational informatization plans and policies in S. Korea*

Plans	Establishment Year	Name of The Plan	Period	Vision	Stage	Phases	Time Period	Educational Phase	Strategies
1	Jun. 1996	Basic Plan for Promoting Informatization	1996-2000	Providing the best informatization by 2010	Computerization	Phase 0	1970-1995	Introduction of computer education	Computer education Plan (1970) First educational computer at school (1971) Curriculum of Computer education (1974) Plan for boosting computer education (1987) Plan for distribution of school computers (1989)
2	Mar. 1999	Cyber Korea 21	1999-2002	A creative and knowledge-based Nation building	Establishment and Expansion of Infrastructure	Phase 1	1996-2000	Construction of ICT Infrastructure	First educational portal- EDUNET (1996) Research Information Sharing Service (RISS) (1998) Foundation of KERIS (1999) Protocol for ICT use in Education in primary & secondary schools (2000)
3	Apr. 2002	e-Korea Vision 2006	2002-2006	Construction of e-Korea		Phase 2	2001-2005	ICT utilization	System for educational information sharing (2002) Improvement in teacher training programs Web-based administration system- NEIS (2003) Cyber Home Learning system (2004) e-Learning global cooperation center (2006)

Plans	Establishment Year	Name of The Plan	Period	Vision	Stage	Phases	Time Period	Educational Phase	Strategies
	Revision Dec. 2003	Broadband IT Korea Vision 2007	2003-2007	Construction of advanced e- Korea		Phase 3	2006-2010	Progression	Plan for Digital Textbook Development (2007) U-classroom (2007) Movement of Digital textbook model schools (2008) Education cyber security center (2008) Open course service- KOCW (2010)
	May 2006	Master Plan for u-Korea	2006-2010	Construction of u-Society on the best u-Infrastructure					
4	Modification Dec. 2008 Mar. 2012	National Informatization Master Plan	2008-2012 2008-2012	Creation of advanced knowledge nation with creativity and safety	Utilization Expansion and Integration	Phase 4	2011-2013	Educational innovation with ICT	Strategy of SMART Education (2010) Upgraded NEIS (2011) e-Textbook (2012) A data system of educational and statistical information of schools- EduData System- EDS (2012) Movement of Smart Model Schools (2012)
5	2013		2013-2017			Phase 5	2014-2018	Creative & competence based education	Customized learning for all educational levels Enhancement of Higher education for creative human resources Enhancement of lifelong & Technical and Vocational Education and Training for a skill-oriented society Stabilizing educational welfare for equality

Turkish Case

Efforts to embrace new social transformations expressed by the concept of information society have begun in the 1990s in Turkey. In this period, the various reports and research studies as well as foregrounds regarding the coordination of certain elements of the information society were established. However until 2000s, it was not possible to implement the stipulated actions by the prepared reports (Cagiltay, Askar & Ozgit, 1995) or utilize them effectively. For example, Information and Economic Modernization Report which was prepared with the help of World Bank in 1993 or Turkish National Information Infrastructure Master Plan (TUENA) in 1999 created as an extension of Informatics Working Group Report in 1995 couldn't be implemented (Turkish Ministry of Development, 2014a). However, since 2003, there has been a continuity in the implementation of the strategy and action plans employed under the coordination of the Ministry of Development (see Table 2.21).

With the support of the World Bank, National Education Development Project (MEGP) was signed and launched to be implemented within 7 years to increase the quality of schools and teachers and to develop administrative and management skills of ministry of education (The World Bank, 2000). Within this scope, technology equipment was provided to selected schools and experiments were carried out before it was expanded. With Computer Trial School (BDO) and Computer Laboratory School (BLO) projects, Curriculum Laboratory Schools (MLO) Project, Internet Project for Schools (ADSL) and with Basic Education Project Phase 1 and Phase 2, computer laboratories were established then the infrastructure of the schools was started to be provided and technology resources of the schools were planned to be increased (Bayrakci, 2005; MoNE, 2007).

In Turkey, the effort and works for the introduction of computers and internet access to schools, training of teachers for the use of information technology and integration of information technology into the education system has been going on since 1998. Within the scope of the Sixth Seventh and Eight Five-Year Development Plans, the necessity of using technology in education was emphasized in order to be a knowledge and technology society.

For the first time in 1998, the Ministry of National Education included elective computer courses into the curriculum in order to ensure the acquisition of basic computer literacy in elementary schools. Although the name and the instruction schedule of the course were frequently changed between the years 1998-2013, the course had always remained as one of the elective courses available.

With the changes made in the Turkish Education System during the academic year 2012-2013, “Information Technologies and Software” as an elective lesson has been put into the program of secondary schools and elective “Information Technologies” lesson has been gradually abolished. At the end of 2013, in the course schedule published by the Ministry of National Education for 2013-2014 academic year, “Information Technologies and Software” course has been categorized as compulsory in the 5th and 6th grades of lower secondary school, and as elective in 7th and 8th grades. Instructions consist of 2 teaching hours per week (see Table 2.20). In 2017, the Ministry of Education Monitoring and Evaluation System provided a suggestion for an update of the curricula (Mercimek & Ilic, 2017). The curriculum for the Information Technology and Software course is also in process of updating within this context. In this draft, the objectives of the ITS course are integrated into the courses and planned to be given to 1st – 4th grades in primary education. However, the draft has not been put into practice yet.

Table 2.20. *Information-related lessons in Middle School*

Classification	Grade	Category	Subject	Time Period	Learning Objectives
Middle School	5–6 7-8	mandatory course elective course	Information Technologies and Software	2 teaching hours per week	• Understanding of Information Technologies • To comprehend the aims and importance of the concepts of ethical values, digital citizenship and security • Use of Technology for Communication, Research and Collaboration • Ability to create products with utility programs • Gaining the skills of problem solving and programming

The change didn't happen only in the name of the course but also the content, teaching approach and implementation. However, after the change in the status of lesson, the curriculum for the elective course continued to be applied until the completion of the new curriculum preparation in 2017. The titles of the learning areas specified in the curricula issued by the MoNE (2012) are as follows:

- Information Literacy
- Using Information Technology for Communication, Information Sharing and Self-Expression
- Research, Information Structuring and Cooperative Work
- Problem Solving, Programming and Original Product Development

In 2010, a project called Movement of Increasing Opportunities and Improving Technology (FATIH) started to be implemented. The aim of the FATIH project was to provide equal opportunity in education and to improve the technology in the schools. Within the scope of the project, it was targeted to install laptop computers, projectors, internet connection and smart board in the classrooms of all schools in primary and secondary education. In addition, the creation of electronic educational content was targeted. FATIH project included tablet computers, interactive boards, "Educational Information Network" (EBA- http://www.eba.gov.tr/) and academic research activities for teacher training and project development and reporting (Turkish Ministry of Development, 2014).

Pilot implementations were conducted in 17 provinces and 52 schools. Since the project has started in 2012, the total number of schools with completed infrastructure installation was 14 154 (MoNE, 2017a). For the effective use of information technology tools in the learning-teaching process in primary education and secondary schools; FATIH project intends to install an interactive board and internet infrastructure for all classrooms, to provide multifunctional printer for each school and to distribute tablet computers to all students in the 5th to 12th level of education system and to all teachers. In-service trainings are given to teachers to ensure effective use of equipment provided within the scope of FATIH Project in the learning-teaching process. In this process, the curricula is made compatible with information technology-supported teaching and educational e-contents are created. Production of e-learning materials for Turkish Language and Literature, Physics, Chemistry, Biology, Geography, History, Foreign Language, Information Technologies, Religion Culture and Ethics courses are continuing for all courses in elementary, middle and high school level.

Turkey has participated to online projects such as eTwinning, eSafety, Scientix, Maker Fair the European Edition, Web-we-want (eSafety) ve School Education Gateway, European Schoolnet and Future Classroom Lab (FCL) (MoNE, 2017a).

Table 2.21. *Summary of national strategy and action plans in Turkey*

	Policies for the Information Society			Establishment Year	Period	Educational Policies & Projects	Period	Strategies
1	Five-Year Development Plan 1990-1994	National Education Development Project (MEGP)	The World Bank Collaboration with Ministries of Education in OECD countries	1990	1990-1997	Computer Trial School (BDO) Project	1993	The establishment of computer laboratories for spreading computer-aided education and computer education
						Curriculum Laboratory Schools (MLO) Project	1995	Providing tech support to selected schools
						Computer Laboratory School (BLO) project	1996	Provision of technological resources
		Information and Economic Modernization Report	In cooperation with The World Bank	1993		World Links for Development Program (WorLD)	1997-2002	ICT for Education Program Collaboration with Ministries of Education Cooperative learning by using the Internet
2	Turkish Science and Technology Policy: 1993-2003		1993	1993	1993-2003	Seventh Five-Year Development Plan	1996-2000	Establishment of the bases of the national innovation system Breakthrough Project in Science and Technology - 1995
	Turkish National Information Infrastructure Master Plan - TUENA		1999	1999	Not applied	Basic Education Project Phase 1	1998-2003	3188 Information Technology Class was established for 2.802 elementary schools. 45,000 computers, hardware, software and peripheral equipment were purchased for 22,854 rural schools

	Policies for the Information Society			Establishment Year	Period	Educational Policies & Projects	Period	Strategies
3	Eight Five-Year Development Plan 2001-2005	E-Turkey Initiative Action Plan	In cooperation with European Union	2000	2001	Ministry of National Education Integrated Management Information System (MEBSIS)	2003	Establishment of Information Society Establishment of E-Turkey E-education
		E-Transformation Turkey Project	State Planning Organization	2002	2003-2006			
		Short-term action plan	State Planning Organization	2003	2003-2004	Basic Education Project Phase 2	2002-2007	To support the Basic Education policy, 4002 classroom computer laboratories were established in 3000 primary schools in order to increase the quality of education, increase capacity and increase access to education,
						Internet Project for Schools (ADSL)	2003-2011	Providing internet access to schools of all levels
		E-Transformation Turkey Project 2005 Year Action Plan	State Planning Organization & Public and non-governmental organizations	2005				
4	Information Society Strategy			2006	2006-2010	4,500 full-time Public Internet Access Centers (KİEM)		
						Fatih Project	2010- in progress	Educational Information Network (EBA) Interactive board and internet infrastructure for all classrooms Tablets for all students in the 5th to 12th level and all teachers

	Policies for the Information Society	Establishment Year	Period	Educational Policies & Projects	Period	Strategies
5	Information Society Strategy and Action Plan	2014	2015-2018	National Cyber Safety Strategy and 2013-2014 Action Plan	2013	
				Lifelong Learning Strategy Document and Action Plan	2014-2018	It is aimed to increase the knowledge and skills of adults in areas such as innovation and information technology It is aimed to disseminate distance education in order to support education access of disadvantaged groups.

CHAPTER 3

METHODOLOGY

3.1. Introduction

This chapter addressed, outlined and described the research methodology and the justification utilized for the design of the study. Firstly, it presented the research questions that formed the framework of the methodology followed by an explanation of the data collection and analytical processes employed to formulate and derive conclusions from the study findings, including the selection of the appropriate cases to be studied. Additionally, the descriptions of the cases studied and schools visited were presented.

3.2. Research Questions

The purpose of the study was to investigate and analyze within the boundaries of a Multi-Level Ecological Perspective (Zhao & Frank, 2003) the differences and similarities in the aspects affecting Information and Communication Technology (ICT) integration in classroom practices in the following countries; Turkey, Finland and S. Korea. The key focus of the study was to provide a comprehensive understanding of the aspects that enable or inhibit teachers' educational ICT-related practices across national, school and classroom level environments. To achieve this purpose, appropriate research question weas formulated as a result of an intensive and comprehensive literature review on ICT integration practices in education that are currently employed in a variety of countries. Throughout the study, the researcher in consultation with experts modified research questions to ensure the best fit among varying contexts.

The study was determined to be based on the effort to answer the core question below:

1) What are the differences and similarities in the aspects affecting ICT integration in classroom practices within the contexts of Turkish, Finnish and S. Korean education systems from a multi-level ecological perspective?
   a. At macro level? (Regional and national entities)
   b. At meso level? (The school and local community)
   c. At micro level? (The classroom setting)

3.3. Overall Research Design of the Study and the Justification for the Design

The aim of the study was to investigate and analyze within the boundaries of a Multi-Level Ecological Perspective (Zhao & Frank, 2003) the differences and similarities in the aspects affecting ICT integration practices in the classrooms of; Turkish, Finnish and S. Korean public schools. A qualitative research was conducted in an effort to learn from the experiences of other countries, which particularly have been reported to achieve higher standards in their education systems. The overall representation of the particular approaches employed in the study takes place in Table 3.1.

Table 3.1. *The Representation of Selected Approach for the Study*

Elements	Selected Approach for the Study
Paradigm	Constructivist/Interpretivist
Ontology	Relativist
Epistemology	Subjectivist
Methodology	Naturalistic Inquiry
Method	Qualitative Research
Qualitative Research approach	Descriptive/Interpretive Multi-Case study

Throughout the research, a comparative qualitative multi-case study approach was employed, which utilized qualitative research methods based on the existence of cases to be studied from three different countries. The research study was considered multi-case, as the purpose was to explore the differences and similarities in terms of a contemporary phenomenon and its parts within and between the cases in a paradigm that does not allow for the separation of the phenomenon and its context evidently (Yin, 2003).

The application of a qualitative multi-case study was determined to be the most suitable approach by the researcher as it allows for a more fulsome understanding of the complex issues surrounding ICT integration at the national, school and classroom levels. Additionally, a qualitative research method was also used to probe the complex nature and dynamics of the educational ICT integration processes of the three countries through the compilation and analysis of the subjective voices of the individual participants/respondents to practically address the research problem (Creswell, 2003).

A qualitative case study approach was appropriate to examine the ICT integration process of educational institutions in a more detailed way by allowing comprehensive collection of data from multiple sources in a more flexible and responsive manner. For this reason, the research study relied on multiple and rich data sources, in the form of; interviews with teachers, principals and ICT advisors, direct observations and academic literature review related to ICT integration process and effective factors on the process. In accordance with the methodology, the data was collected with the help of researcher's observations and insights about the individual contexts and situations that occurred throughout the period of the study. However it was acknowledged given the nature of the study and the research methodology employed that factors such as the "sensitivity and integrity of" the researcher are likely to influence the outcomes of the study (Merriam, 1998, p.52). Accordingly, the collected data in this study is closely connected to the researcher.

Due to the nature of the research questions, the study was shaped within a constructivist/ interpretivist paradigm that entailed a belief in relativist ontology, a subjectivist epistemology and naturalistic methodology (Denzin & Lincoln, 2008; Guba & Lincoln, 1994; Mackenzie & Knipe, 2006). There were multiple and varying realities to interpret and make sense of in the real world, and that knowledge and information were reconstructed by the researcher and individual participants/respondents based on their own experiences within the natural setting or context. Thus, a qualitative research method of collection and analysis most appropriately fitted within the bounds of the research paradigm (Bogdan & Biklen, 1998; Denzin & Lincoln, 2008; Merriman, 1998).

Additionally, and most importantly for the study, the use of a qualitative research methodology enabled the researcher to answer the research questions within the Multi-level Ecological Perspective by establishing a holistic picture of the varying aspects that contribute to the complex phenomenon rather than being restricted to examining individual components of the phenomenon as would have been achieved by utilizing a quantitative research methodology (Merriam, 1998; Fraenkel, Wallen & Hyun, 2012). The qualitative research methodology was assessed as the most applicable one to ensure that the researcher could obtain detailed and comprehensive descriptions of how and why different practices were being employed in different teaching-learning settings and contexts (Creswell, 1997).

Case studies are one of the major types of qualitative research methodologies (Creswell, 1998; Denzin & Lincoln, 2008; Guba & Lincoln, 1994; Patton, 1990) and a case study differs from other approaches by focusing on "a bounded system". Moreover, case studies gather necessary data in a relatively short period of time (Hays, 2004) without focusing on cultural interpretations of shared practices in contrast to ethnographies (Creswell, 2009; Yin, 2014). Based on this information, an appropriate time frame of 4 months was determined for the field investigation component of each case study. Additionally, data collection methods of a case study were not necessarily limited to a phenomenological perspective to build an in-depth explanation of a phenomenon. As such, the research study did not employ a phenomenological perspective given the research questions were not seeking an understanding of the essence of human experience from the perspective of participants (Creswell, 2009, Patton 2002). While Figure 3.1 illustrates the timeline of data collection process, Table 3.2 shows the research methodology at a glance.

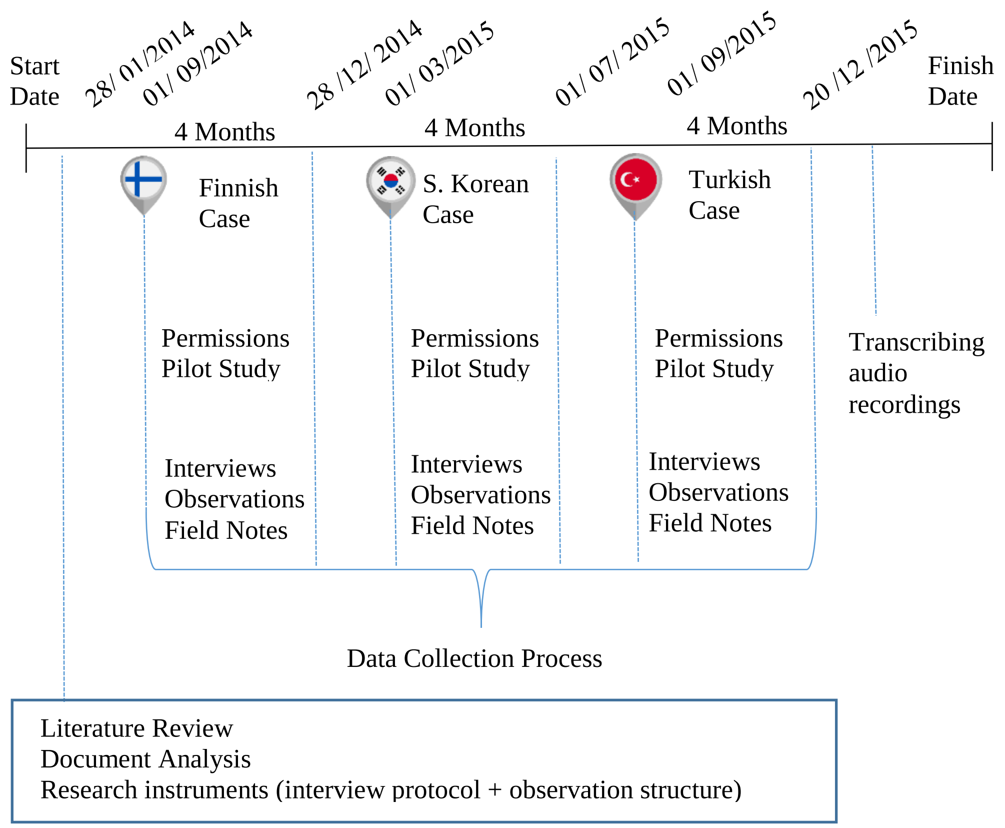


Figure 3.1. The Timeline of Data Collection

Table 3.2. *The research methodology at a glance*

Research Components	Descriptions
Method	• A Qualitative multi-case study
Bounded System of the cases	• Educational context in the Countries
Nature of the Phenomenon	• Teachers' experience of educational use of ICT in the classroom context
Participants	• Teachers + Principals + ICT advisors/coordinators (19Finnish/20S. S. Korean/21Turkish participants)
Sample Selection	• A purposive sampling • Snowball/chain sampling technique
Selection of schools	• Receiving assistance from experts in each country
Data Sources	• Semi-structured interviews • Field and observation notes • Documents
Data Collection	• The Research Permits • Interview Protocols • Informal direct observations throughout field visits • Multiple observers • Creating a case study database
Data Analysis	• Categorizing strategies (coding and thematic analysis) • In an exploratory manner with the help of an inductive approach • A data driven thematic analysis • A 6-step process
Trustworthiness	• Validating accuracy and credibility (see Table 3.29 for details)

3.4. Case Study Design

The research study drew on the strength of the case study approach. As such, the research study utilized a qualitative multi-case study approach with the aim of providing an in-depth understanding of the aspects that contribute to or hinder the integration of ICT in the teaching-learning process through classroom interaction ranging from year 1 to 12. Moreover, the use of a multi-case study design as outlined by Yin (1994; 2003; 2009; 2014) and formed by Merriam (1998) allowed the researcher to develop a more complete description of ICT integration processes as a complex phenomenon involving various elements by utilizing a combination of descriptive and interpretive approaches.

A case study approach is an appropriate selection when; a contemporary phenomenon in a context is examined and it is not possible to clearly separate the phenomenon's factors from their context (Yin, 2009) or if the researcher is interested in describing and discovering the context (Merriam, 1998). Case study research often formulates in a qualitative nature. Varying forms of 'cases', which can be organizations, business units or teams, are often investigated in depth through observation or interviews, in order to draw a detailed picture of qualitative particularities. The choice of a case study design depends upon what the researcher is investigating and in particular the questions to be addressed (Merriam, 1998).

Case study research provides a level of flexibility by allowing the researcher to build a particular research philosophy in terms of data selection, data collection and analytical methods, based on the boundaries of the research topic and the definition of reality drawn from the researcher's perspective. In this research study, both Yin's (2009) and Merriam's (1998) classifications were used to formulate and apply the most appropriate methodology. As the intention of the study was to explore the phenomenon and provide a detailed and in-depth description of the phenomenon in its specific context without hypothesizing, not judging or evaluating the data, the overall study can be considered as descriptive-interpretive (Merriam, 1998; Yin 2009).

3.4.1. Determination of the Cases

To formulate the research study, cases were selected from three different countries (Turkey, Finland and S. Korea). For each of the countries, the level of comparison was national. According to PISA results, unlike Finland and S. Korea, which were among the higher achieving OECD member countries, Turkey, in all areas (reading, mathematics and science), was ranked comparatively lower. According to the published results, Turkey was unable to achieve the desired levels of success throughout the passing years (OECD, 2015). This situation was examined in detail in the definition of the cases.

The reason that the research study focused on a national level of comparison was due to practical and theoretical issues. For example, the selected countries have varying classroom environments as a result of their different; education systems, national curriculums, education policies, and purpose and intent of investment in ICT. However, description of similarities and differences in practice may reveal the actual context and implementation of ICT use. Thus, multiple cases were selected and investigated in a comparative setting to discover and explain differences and similarities between cases.

Major components of the research design and related justifications are presented as follows (Merriam, 1998; Yin, 2009):

1. Bounded system: A case can be seen as a phenomenon of constructed reality by individuals in a bounded context (Merriam, 1998; Stake, 1995). Depending on what the purpose of the study is and what the rationales behind the decisions are, a country may be defined as a case, a group of people, a unit or a case study itself (Gerring, 2004). Cases in this study were bounded by (a) education system of the countries (b) geographical location of the countries (c) time period -only 4 months field research for each country and (d) conceptual framework of the study (ICT use in education and ICT integration).

ICT use of teachers in the classroom in selected countries was the phenomenon investigated, classrooms were the bounded system, and their entire education system was the context. The purpose was to propose the whole picture of ICT integration which cannot be separated from neither entire system nor unique characteristics of the selected countries. The comparison of how they actually integrated the technology into education was limited to multiple actors within the education system in the selected countries.

2. Unit of Analysis & Unit of observation: Units of analysis are not necessarily required to be the same as the units of observation (di Gregorio & Davidson, 2008). Because, while ‘unit of analysis’ refers to an entity that is being studied and a level at which results are determined, ‘unit of observation’ is a level at which data is collected in order to understand the ‘unit of analysis’. Concordantly, unit of analysis is formed by the research questions, while ‘unit of observation’ is determined by the data collection methods.

In the research study, the ‘unit of observation’ was the multiple actors (teachers, principals and ICT coordinators/advisors) within the three countries and corresponding education systems who were interviewed and observed in their respective classroom and school environments. The observations supported the researcher in gaining an understanding of the in-class events. It is difficult to draw a clear line between the units in the context of qualitative research since it is very hard to find a definitive distinction between the unit of analysis and unit of observation.

3. Nature of phenomenon: In the research study, not all of the potentially important aspects of ICT integration into education were known in advance in each context. Additionally, complex differences of participants’ experiences would reveal different findings within and in-between cases. The technology integration and the experiences of the participants could not clearly be separated from the context of the study. Thus, a research design that allowed to keep an open mind within a given research parameter was required to understand the complex phenomenon as teachers’ use of ICT investigated in its real world context where it is found and functioned. As, Merriam (1998) claimed that “the case study offers a means of investigating complex social units consisting of multiple variables of potential importance in understanding the phenomenon” (pp. 41), the nature of the phenomenon within the current study certainly required a case study design.

4. Nature of research questions: According to Yin (2009), case studies are favorable when “how” or “why” questions are being asked. The research study explained differences and similarities in ICT-related practices that exist at classroom level, and illustrates how ICT was actually integrated into education; at the national, school and classroom level in Turkey, Finland and S. Korea by providing barriers and enablers of the ICT use process.

5. Nature of event: Case studies are suitable when contemporary events are investigated and when behavior cannot be controlled (Yin, 2009). Case studies can provide a broad range of data collection, such as observation or interviews with people currently involved in the event. Experiments are a suitable research strategy if the researcher can control the behavior of the investigated events/people in general. When conducting the research study, the researcher did not have any control over the behavior or conduct of the multiple actors (teachers, principals and ICT coordinators/advisors) throughout the observations and interviews.

6. Multi-case design: The scope of a comparative study may cover a range including more than one nation or it could be arranged to compare the conditions of one specific geographical unit but in different times and/or having different policies (Theodoulou, 2002). Within the studies employing a methodology of comparative approach, as Ragin (1987) stated, a case oriented research strategy is used. As further noted in the study of Ragin (1987), cases given within the qualitative research are regarded as configurations that are formed by the combined characteristics and they can be treated as a whole. The study approach that is referred as multiple case has the purpose of observing the processes and outcomes derived through several cases or sites. This approach also helps to comprehend how these processes and outcomes get qualified by the local conditions and lead the development of more sophisticated and more powerful explanations" (Miles & Huberman, 1994). Among the purposes shaping and guiding this study, comparison of the cases took its place.

As the research study was built on three cases in different countries, it was classified as a multiple-case (cross-case) study (Merriam, 1998; Yin, 2009). A multi-case study design was conducted, which comprises the comparison of cases that differ on certain crucial characteristics. Moreover, it was helpful to identify important patterns formed by the data collection. It aimed to provide a comparison of actors, institutions and processes within the borders of the cases. The levels of comparison were national in Turkey, Finland and S. Korea. Units of comparison were the aspects of educational implementation of ICTs in the classroom environment of the three countries studied. ICT integration process in terms of these implementations were analyzed, described and illustrated using qualitative research methods.

3.4.2. Contextual Settings of the study

In this part of the study, only the visited schools and their characteristics are presented. A descriptive background information is provided in the literature review part in order to illustrate the current context of education systems and societies which operates differently in each country, where the purpose was to do justifications respectively while comparing them. Therefore, in this section, the context definitions of the schools and classes accessed and visited are provided rather than the information similar to those given in the literature.

3.4.2.1. Visited Schools and Their Characteristics

This section described the visited schools in each country and their characteristics to give readers an idea about the actual context in general. It was written with the help of the journal kept by the researcher and photographs taken by her.

3.4.2.1.1. Finnish Schools

In the province of Eastern Finland, in North Karelia Region, 7 different schools visited which were located in 2 different cities – Joensuu and Savonlinna. Observations were made in 25 different classes. The observations and interviews were conducted starting from September 1st to December 28th 2014 for 16 weeks. The researcher spent 1 week in each selected school. List of visited schools in Finland is shown in Table 3.3 below.

Table 3.3. *List of visited schools in Finland*

#	School	School Type	City	# of Participants	# of Teachers in School	# of students in School
1.	Joensuun Normaalikoulu	University Teacher Training School 1-12	Joensuu	3	400	1000
2.	Joensuun Lyseon Lukio	High School 10-11-12	Joensuu	2	-	-
3.	Nepenmäen koulu	Primary School 1-6	Joensuu	2	33 (+ 11 assistant teacher)	360
4.	Pataluodon Koulu	Lower Secondary School 7 - 9	Joensuu	2		
5.	Noljakan Koulu	Primary School 1-6	Joensuu	2	18	
6.	Savonlinna Normaalikoulu	University Teacher Training School 1-9	Savonlinna	4	40	360
7.	Martalan Koulu	Comprehensive School 1-9	Savonlinna	4	-	700
7 Schools in North Karelia Region in the province of Eastern Finland		2 Training School 2 Primary School 1 Lower secondary School 1 Comprehensive school 1 High School	in 2 Cities (Joensuu & Savonlinna)	19		

Organizational Norms

In Finland, teachers were able to apply for a position in any school they wanted as long as schools had a public recruitment notice for the job on their official school website. Some teachers from any subject matter may be required to have basic computer certifications to be qualified to make these job applications, some others may be required to have programming knowledge depending on the needs of the school. Schools were able to determine their recruitment needs according to the needs of the curriculum, school, teachers and students. Teachers who were assigned to or volunteered for helping the school with computer or technical work were paid a small fee for additional work they did.

A separate department for computer education doesn't exist in Finnish faculties as a source of teacher. Informatics/computer trainings are given under faculties such as mathematics as a minor subject. For this reason, the teachers who were graduated mainly from mathematics or science were responsible for IT services and IT support in visited schools. Moreover, they were helping other teachers about technical and pedagogical issues if necessary. There weren't any separate lesson for computer education, rather, it was integrated into other subjects. For example, a classroom teacher was teaching basics of programming (Scratch) in math class hours or students prepared a presentation by doing research on the Internet for the history lesson within the class hour.

During the study visits in Finland from September 2015 to December 2015, a new curriculum had been developing and the curriculum was planned to be implemented in spring semester 2016. At that time, teachers had only heard that emphasis was on the increase in the use of technology in the curriculum. For example, advanced programming would be taught, but teachers did not have any idea who could teach or how it would be thought. They were little worried about the educational sources and methods.

School Settings

In Finland, two types of schools were visited: University teacher training school and general public school. Among the total 7 schools visited in Finland, 2 of them were training schools located in 2 different cities as parts of the same university. The other 5 schools were general public schools placed at again 2 different cities in the same region.

The University Teacher Training Schools in Joensuu and Savonlinna were administratively the parts of the Philosophical Faculty, University of Eastern Finland. Savonlinna University Teacher Training School offered pre-primary and primary education, while pre-primary, primary and upper secondary education were offered in Joensuun University Teacher Training School. The distinguished goal of these schools was to provide guidance and counselling training for preservice teachers as part of their pedagogical studies in an environment with good facilities and employees with innovative perspectives. Since these schools were a part of universities and teacher training schools, they supported educational researchers and research. Furthermore, they also conduct their own research and development studies. Moreover, they had more sophisticated infrastructure and facilities than the other schools. They were eager to implement and test innovative teaching-learning approaches as teachers' self-development efforts or by participating in international projects.

There were some differences between the general structure of the schools and the classroom environment and the opportunities they had. However, the basic characteristics of these schools and classrooms were almost the same. The differences among the visited schools and cities weren’t so big due to the principle of equality in education and quality of education that Finland always emphasized and valued. For instance, the training schools and other schools that were located in the city center, urban or rural areas had similar access to teaching materials and resources. Nevertheless, small schools or rural area schools were only able to access fewer number of technology itself (see Table 3.4). For example, if teachers of small and rural area schools wanted to use the tablets in their lessons, they would have to book them from city board with the help of an online system. Although the school had some technology available such as laptops and tablets, sometimes it was not enough for everyone.

Each school has a computer room or area for students. Computers were used for lectures or students were able to use them anytime for their research purposes. The computers mostly had internet access. However, in some schools, shared tablets that provided by city board weren’t able to connect internet in the schools. Thus, when students conducted a study on the tablets but could not finalize it within the allocated class hours, they were not able to save their study by uploading it to personalized cloud accounts. Therefore, in the next class, they either had to start over or they just skip it and move to the next activity, which causes some loss of efficiency regarding the classes.

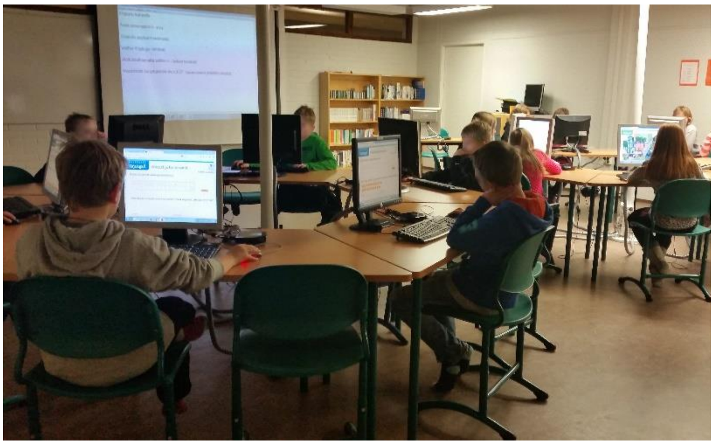
Table 3.4. *Access to Technology*

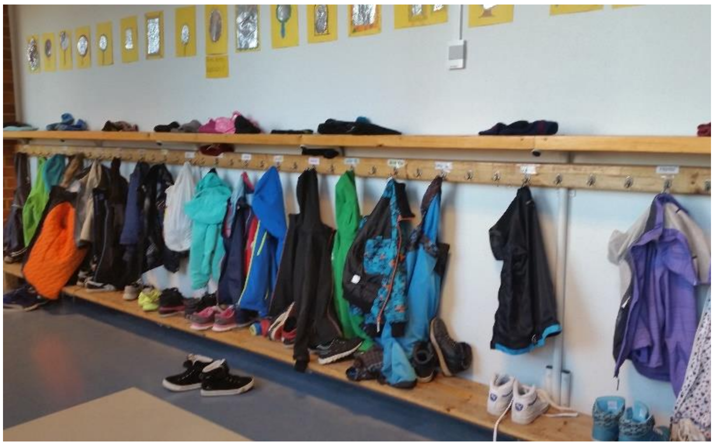
School	Definition	Picture
A small school	In this school, they have a small computer classroom for 11 pupils. When they can’t book a set of tablets or notebooks from city board, they have to go to computer room as a part of lesson plan. Students are transferred to computer room alternately. Teacher assistants play a big role in this case.	 

School	Definition	Picture
A training School	Training schools have access to many different technology and materials. Each student can use a tablet or laptop if necessary.	
	They store laptops in a big charger machine that facilitates transportation of laptops within the school.	

The visited schools had always an actively used library, a room with computers, and a place to spend leisure time, study spaces for students and a cafeteria where students and teachers had free lunch. Teachers, students and administrators were often in continuous interaction and communication. There was no dress code for students and teachers in the schools.

Table 3.5. *Finnish School Settings*

School	Definition	Picture
Joensuun Normaalikoulu	A library	
Nepenmäen koulu	A computer room	
Joensuun Normaalikoulu	A place to spend leisure time	

School	Definition	Picture
Martala Koulu	A study space for students	
Savonlinna Normaalikoulu	A cafeteria	
Noljakan Koulu	A school corridor	

School	Definition	Picture
Nepenmäen koulu	A classroom	

A shared teachers' room at the schools was pretty well equipped. Spacious and relatively large teachers' room had a ready-to-use computer, a kitchenette and tea and coffee supplies. The teachers' rooms with comfortable chairs and round tables were designed to facilitate the communication of the teachers. Some of the schools had a private room for a classroom teacher right next to their classrooms. Moreover, there was also a private teachers' room for a group of teachers from the same subject. Teacher rooms are usually located right next to the principal's room. Some schools even provided access to the principal's room from the teacher's room directly. There were not very sharp separations and differences between the teachers and the administrators in terms of respect shown, accessibility and spaces offered.

Table 3.6. *Rooms of teachers*

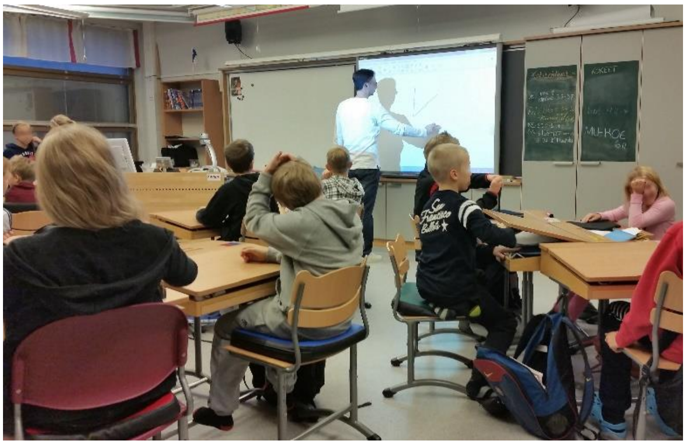
School	Definition	Picture
Savonlinna Normaalikoulu	A shared teachers' room	
	A kitchenette	
	Supplies	

School	Definition	Picture
Joensuun Lyseon Lukio	A shared teachers' room with computers	
Joensuun Normaalikoulu	A private as well as shared teachers' room for a group of teachers from the same subject	
	A private room for a classroom teacher that is attached to the classroom where he teaches.	

Classroom Setting

Every single classroom that was visited had a projector and a computer allocated for the teachers' use. Physical structure of all the classrooms was designed to enable a student-centered, active and engaged learning environment. The design of the classes was influenced by teaching methods such as collaborative learning and learning by doing. Cluster configuration of classroom arrangement also allowed students to move around freely and engage to each other. While students performing the activities related to lessons, they were free to choose how to do the given assignment: by standing, lying on the ground or doing on the table or with or without technology. Moreover if students got bored or needed a time-out from the lesson, some teachers let them go out and play ping pong.

Table 3.7. *Examples of classroom settings*

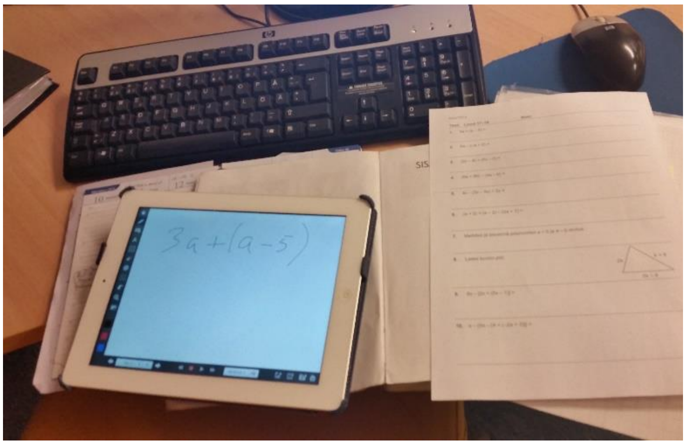
School	Definition	Picture
Joensuun Normaalikoulu	The physical arrangement of desks in a classroom allowing students to work in groups	

	Students doing in-class activities while sitting on the ground	
Savonlinna Normaalikoulu	Students doing in-class activities	

Teachers were open to try new pedagogical approaches. Although, they were encouraged to use technology in education, they did not completely abandon traditional teaching methods. All the materials and technologies that were available were included in the teaching and learning process when only required. For example, using personal phones for educational purposes was promoted for older students. Teachers mostly supported group work during a learning activity. This was often seen as a useful approach when the number of technology to be used was small. Moreover, some teachers used inflatable balls as chairs instead of regular seats in classrooms in order to make the students feel more comfortable and somehow enable student participation in lessons.

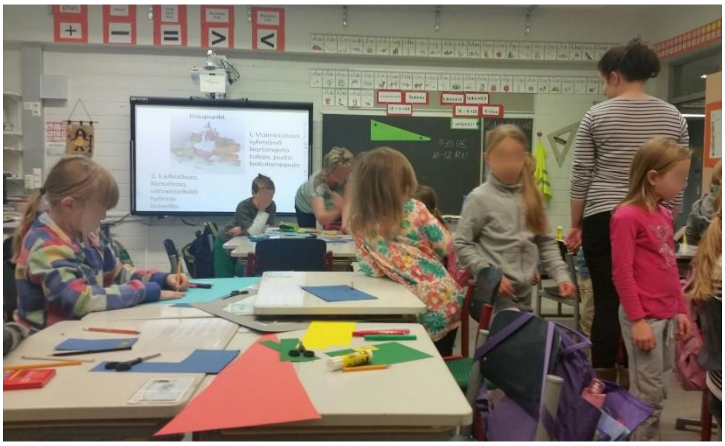
Table 3.8. *Pedagogical perspectives*

School	Definition	Picture
Savonlinna Normaalikoulu	Teaching and learning with technology in the first half of lesson hour	
	Teaching by a teacher’s assistant with a traditional manner in the second half of lesson hour	
Joensuun Lyseon Lukio	Using personal phones for voting to answer the questions	

School	Definition	Picture
Martala Koulu	Two students working with one tablet	
	Combination of materials used during the lesson	
Joensuun Normaalikoulu	Inflatable balls used as chairs in a classroom	

There were assistant teachers hired in the schools with enough budget. These assistant teachers had a crucial role in the classrooms in terms of facilitating teaching activities, giving individual feedbacks and communicating and assisting the students individually. As students from disadvantaged groups and children with learning disabilities had the same opportunity to get education with the other students in the same classrooms in Finland, assistant teachers as well as other teachers were supportive, helpful and encouraging for all kinds of students. For example, children with learning disabilities who were in a primary school were supported and educated by an additional 1-2 hours after the daily course schedules to catch up with the other kids.

Table 3.9. *Teachers' assistant*

School	Space	Picture
Noljakan Koulu	A classroom with students, a teacher and a teacher's assistant	

Although preparing the course content in Finnish language was not a very common practice, materials prepared in English were easily used in the classrooms for educational purposes. For example, Kahoot (a game-based learning platform), Shobi (a book creator), Socrates (a cloud-based student response system), Khan Academy, variety of Google Services, Edmodo were frequently used applications during in-class activities. Moreover, Peda.net as a school network and Wilma.edu.hel.fi as a student administration program were widely used services in the schools.

3.4.2.1.2. S. Korean Schools

In S. Korea, 11 different schools from 3 different cities – Seoul, Incheon and Chungbuk- visited (see Table 3.10). Observations were made in 30 different classes. The observations and interviews were conducted between 1 of March and 1 of July 2015 for 16 weeks. The researcher spent 1 week in each selected school.

Table 3.10. *List of visited schools in S. Korea*

#	School	City	School Type	# of Participants	# of Teacher in School	# of students in School
1.	Kaewoong Middle School	Seoul	7-8-9	2	65	900
2.	Girls Middle School	Seoul	7-8-9	1	25	250
3.	Buksung Elementary School	Seoul	1-2-3-4-5-6	2	27	352
4.	Yeouido Middle School	Seoul	7-8-9	4	-	926
5.	Seoul Sinmok Elementary School	Seoul	1-2-3-4-5-6	1	-	
6.	Yu-Hyeon Elementary school	Seoul	1-2-3-4-5-6	2	31	450
7.	Seoul Hwagok Elementary School	Seoul	1-2-3-4-5-6	3	60	1050
8.	Ga-gyung Middle School	Chungbuk	7-8-9	1		
9.	Incheon Wondang Middle School	Incheon	7-8-9	1	60	1050
10.	Young Jong Middle School	Incheon	7-8-9	2	-	-
11.	Chungbuk High School	Chungbuk	10-11-12	1	-	455
11 Schools	4 Elementary School 6 Middle School 1 High School	in 3 Cities (Seoul, Incheon & Chungbuk)	From K-1 to K12	20		

Organizational Norms

In S. Korea, in order to become a teacher, they had to take an exam after graduation from school of education. The exam was similar to KPSS in Turkey. However, S. Korean version of this exam, had some questions testing the computer literacy as a different point. Due to these questions, teachers didn't need to take extra certificates in order to prove their basic computer skills.

In S. Korea, the departments of computer education were in a process of closing down in spring, 2015, because of the change in the current curriculum and policies. New government focused on technology integration into subjects rather than teaching computer use as a separate subject. Moreover, in the new curriculum, coding was the main focus considering computer education. So, the government had taken 1000 computer teachers to train them to meet the requirements of new curriculum. The government had stopped hiring computer teachers before the new curriculum was out. Furthermore, in the schools, whether an information/computer lesson would be given as a separate lesson in any semester was decided with the help of consensus achieved among teachers and families. Parents in S. Korea were very much involved in their children's schooling. After the consensus formation, students were able to decide the content of the subject such as Photoshop, office programs, robotics in accordance with their interests.

Information-related contents were allowed to be taught in the scope of Practical Arts for elementary schools, which was a regular subject in the curriculum. In addition, information technologies and information ethics education were selected as themes for the Cross Curricular Learning in purpose of establishing an integrated education system covering all educational activities including any relevant subjects and the Creative Experimental Activities. The educational content in elementary school had focused on using productivity tools such as word processors, spreadsheets, presentation tools, etc. rather than teaching programming, algorithm or computational thinking. However, new government presented guidelines for software use in education. They intended to teach basic knowledge of software programs such as how to do coding and develop programs.

School Settings

The schools in S. Korea that were visited had similar school and classroom infrastructures. The schools had wireless internet that was not shared with students freely due to safety and security concerns. Only few schools had computer laboratories which were actively used by the students, the rest mostly didn't prefer to use the laboratories for lectures. Moreover, there were schools that had a lot of computers in the classrooms stood idle.

Computer lessons as a separate subject were called information lessons in S. Korea. In these lessons, at the middle school level, knowledge of other subject-related technology use was taught. For example, for physics lesson, the computer teacher showed animations about gearing, how to use this gearing program and how the students can make use of this program.

Table 3.11. *Computers in the classrooms*

School	Definition	Picture
Buksung Elementary School	Computer classroom	
	Idle computers in a class	

School	Definition	Picture
Yeouido Middle School	Information technology lesson	

The schools' layouts were often similar in S. Korea. The public schools that were visited had libraries, study rooms and indoor or outdoor sports spaces. Unpretentious and quiet surroundings, unadorned school buildings and a medium size garden were the most obvious common features of schools. Moreover, rectangular shaped classes along the corridors consisted of glass blocks about halfway up to the wall to allow people from outside to observe the lessons or there was certainly a glass space on the doors.

Table 3.12. *School Facilities*

School	Definition	Picture
Kaewoong Middle School	A library	

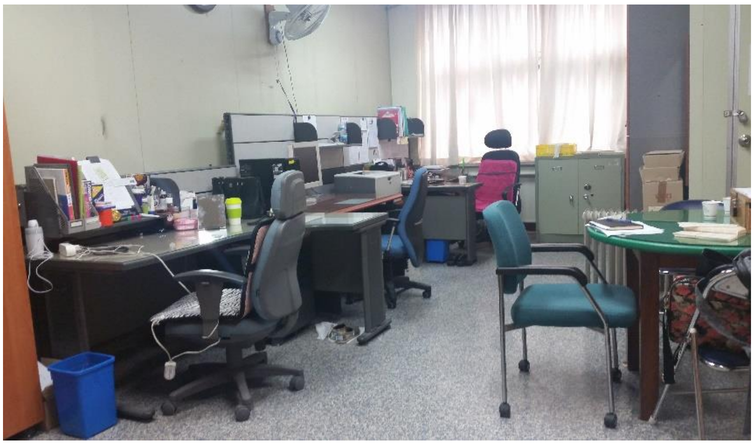
School	Definition	Picture
	A study room	
Young Jong Middle School	Playfield for indoor sports	
	Glass blocks on the classroom walls	

School	Definition	Picture
	Unpretentious and quiet surrounding	

Teacher rooms in S. Korean schools had common standards in terms of technological facilities and structure. All teachers had their own computer and each teacher have their own space next to each other. The teachers' room was more of an open-office rather than an enclosed room. The cooperation and communication between the teachers were supported by the open office concept. Moreover, schools had separate rooms allocated for some group of teachers specifically as well. The principal's rooms in S. Korean schools were commonly located further away from teachers' room. Couple of principal's room had access to teachers' room directly.

Table 3.13. *Teachers' space in the schools*

School	Definition	Picture
Yeouido Middle School	A large open room commonly used as teachers' room	

School	Definition	Picture
	Computers and space of teachers	
Kaewoong Middle School	A shared teachers’ room	
	A private teachers’ room allocated for two English teachers	

School	Definition	Picture
Young Jong Middle School	A private room allocated for 7 teachers from different subject areas	

Classroom Settings

In the classrooms, there were always 1 computer provided for the teachers only, along with the wireless internet, LCD screen or projector and microphone. Not every school had smartboards, tablets or laptops. The most common classroom arrangement in the schools were the columns configuration. Students mostly sit in rows and listened to the lesson. The layout of the classrooms was rarely U-shaped or clustered particularly in high schools. High school students were constantly preparing for the university exam and school administrators did not want the lessons to be interrupted. Thus, it was very difficult to visit high schools and observe educational activities in place.

Surprisingly, technology use was not a common practice employed during teaching activities. But, in elementary and middle schools, technology use was more common than it was in high schools. In high schools technology use level was lower than the other levels due to university entrance exam preparation. Teachers and students were focused on the subject itself in a traditional manner. They mostly preferred direct instructional methods instead of diversifying the instructional methods by incorporating, for example, technology or any other active learning methods.

Teachers were the important characters in the classrooms and schools. Collaboration with other teachers to enhance the use of ICT in teaching environment was hardly practiced since teachers already had a tight schedule that kept them pretty busy. There were intense teaching and learning activities taking all day long in the schools. However, computer education was not one of these intense subjects. Some of the schools visited didn't even have a computer teacher.

Table 3.14. *Seating arrangement of classrooms*

School	Definition	Picture
Chungbuk High School	Columns and rows of desks as classroom seating arrangement	
Yu-Hyeon Elementary school	First graders' seating arrangement	

School	Definition	Picture
	Clustered seating arrangement	

In addition, some teachers utilized the technologies for collaborative learning and communication with students or their parents. Each classroom had its own homepage for notifications, communicating each other, uploading homework. In the curriculum and textbooks, there were elements related to using ICT such as searching information, writing a report, making a presentation, etc. However, active use of technologies in the classrooms was not so prominent. Teachers didn't often prefer using technology. Most of the teachers generally used LCD screen or a projector to enhance their direct instruction method. Some didn't use them at all if the use of technology was not really necessary. Using technology in the classrooms and preparing materials were seen as a waste of time by the teachers. Only one teacher among all observed ones let the students use their personal phones for an in-class activity. Only a couple of teachers was using tablets in classroom environment. Except for a few examples and for the ones using it for the direct teaching purposes, the use of technology was not very common.

Table 3.15. *ICTs in the classrooms*

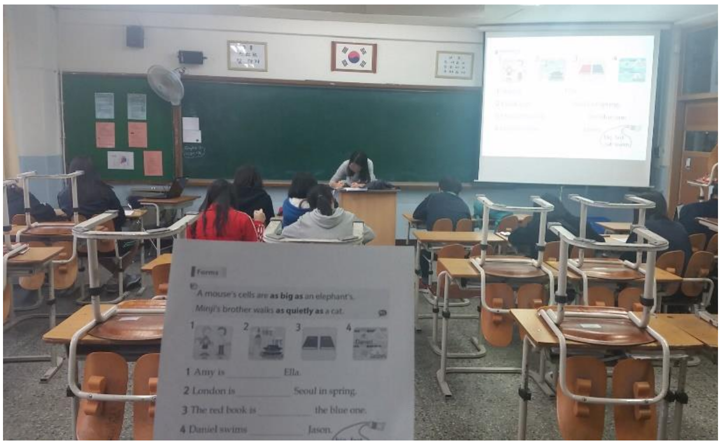
School	Definition	Picture
Ga-gyung Middle School	Using projector and microphone for the purpose of direct instruction	
Incheon Wondang Middle School	Use of LCD screen	
Kaewoong Middle School	Use of personal phones for educational purposes in mathematics	

Students went to the computer laboratory once a week. They were usually focused on how to use the productivity tools and often search information or make their presentation and prepare reports by using these tools. There is an annual budget allocated for educational software expenses related to providing videos, courseware or web sites. Students also could take computer lessons after school at the computer laboratory; for example regarding productivity tools and programming like Scratch as they were decided by family and students.

ICT use in education in general just focused on use of software. But, teachers thought that they could teach programming and algorithm to improve students' problem-solving abilities and help them develop critical or creative thinking skills. In addition, some teachers and parents had some negative thoughts about ICT because they were worried that students would get addicted to Internet or computer games. There was a pressure put on the teachers' shoulders by the parents. The teachers were making an intensive preparation for the courses that were open to parents twice a year. Moreover, the teachers tried to be helpful to the development of the students who wanted to take after-school courses.

Table 3.16. *Examples of Lessons in S. Korean Context*

School	Definition	Picture
Chungbuk High School	Information lesson for developing basic ICT skills	

<table>
<tr><th>School</th><th>Definition</th><th>Picture</th></tr>
<tr><td>Girls Middle School</td><td>An after-school course for mathematics</td><td></td></tr>
<tr><td>Kaewoong Middle School</td><td>An after-school course for English</td><td>
</td></tr>
</table>

Most elementary schools didn't have a uniform code for students. The students could dress up as they wanted. However, middle and high schools had a dress code. Older students had to wear uniforms. At every single school observed, the students and teachers had to take off their shoes and wear slippers at the school.

Table 3.17. *School rules*

School	Definition	Picture
Yu-Hyeon Elementary school	No dress code in elementary schools	
Yeouido Middle School	A dress code in middle school	
Incheon Wondang Middle School	S. Korean students wearing slippers in the class	

3.4.2.1.3. Turkish Schools

In Turkey, 5 different schools located in Ankara were visited (see Table 3.18). Observations were made in 21 different classes. The observations and interviews were conducted from 1 of September to 20 of December 2015 for 16 weeks. The researcher spent more than 1 week in each selected school. Moreover, 3 days were spent at the Directorate General for Innovation and Education in order to interview a unit coordinator of Education Information Network at the Ministry of Education.

Table 3.18. *List of visited schools in Turkey*

#	School	Location	School Type	# of Participants	# of Teacher in School	# of students in School
1.	Ankara High School (Anatolian)	Ankara-Altındağ	High School 9-10-11-12	10	46	610
2.	Keçiören Atatürk Middle School	Keçiören-Ankara	Elementary School 5-8	3	70	1070
3.	Yahyalar Durali Bezci Elementary School	Yenimahalle - Ankara	Primary School 1-4	4	37	602
4.	Yahyalar Durali Bezci Middle School	Yenimahalle - Ankara	Elementary School 5-8	3	34	447
5.	Directorate General for Innovation and Education	Ankara	An Institution	1	-	-
	4 Schools 1 Ministry of Education in Ankara, the capital city of Turkey		1 High School 2 Elementary School 1 Primary School	21		

Organizational Norms

In Turkey, teacher candidates had to take a test, namely KPSS in Turkish, to become a teacher at a public school. This exam was a two-stage exam that measured both general competence, educational science and field knowledge of teachers. However, this exam did not include any questions to measure the computer knowledge like the exam of the S. Koreans did. The exam was held every year and the result of the test was valid for only one year.

During the course of the research, at the fall semester of year 2015, a new curriculum was in the process of being developed, but the lessons were still being processed according to the old curriculum. Information Technologies and Software courses were taught as compulsory courses in 5th and 6th grades and as elective courses in 7th and 8th grades. These grades were especially observed because it was noticed that the computer lessons were mostly accumulated in lower secondary school level. Since the high schools had more technological resources granted within the scope of FATIH project, the observations and interviews in the high schools were more important in terms of collecting in-depth information (e.g. Ankara High School).

In the process of the research, a majority of the primary and middle schools were already transformed into religious schools, namely “Imam Hatip schools”, by the influence of 4 + 4 + 4 system. The high schools also started to be transformed into these kind of schools based on certain rules. This new structuring was causing the infrastructure and resource problems. For example, in the same school garden there were a general elementary school and an Imam-Hatip secondary school together. Two schools with different purposes, lessons and student profiles would share teachers or physical resources for some subjects due to the shortage of teachers and classrooms (e.g. Keçiören Atatürk Middle School).

School Settings

The schools visited (see Table 3.19) in Turkey were diversified in terms of their resources. Yahyali Durali Bezci Elementary and Middle Schools were relatively smaller and located in lower-income regions. These schools also had the lowest physical and material resources available. Keçiören Atatürk Middle School were most populated one among the visited schools and located in a lower middle income area. Ankara High School was one of the oldest schools of Ankara. The building had been protected by the Ministry of Culture because of its historical value. Nevertheless, the school's physical facilities and classes were in good condition. In addition, under the FATIH project, there were smart boards in each classroom as well as tablets provided for each teacher and student at Ankara High School.

Table 3.19. *Exterior view of school buildings in Turkey*

School	Definition	Picture
Ankara High School	Exterior view of school building with a playground	

School	Definition	Picture
Keçiören Atatürk Middle School	Two different schools in the same school garden	
Yahyalar Durali Bezci Elementary School	The physical appearance of a public school	
Yahyalar Durali Bezci Middle School	Middle school building, located right next to the primary school with the same name	

Yahyalar Durali Bezci Primary and Middle Schools consisted of one building and they didn’t have an indoor sports area. They had very small libraries and these were often used as classrooms due to existence of a projector within (see Table 3.21). In addition, their teachers’ rooms were very small and only consisted of a round table, chairs, and a couple of armchairs, a cabinet and a printer. However, other two schools had a relatively bigger teachers’ room and they were relatively well-equipped. For example, they had a computer for the use of teachers, private locking storage cabinets, a little kitchen and tea and coffee supplies. The high school differently had a smartboard in their teachers’ room. The high school also had private teachers’ room for a group of same subject teachers (see Table 20). The photos of the teachers’ room in Turkey were not taken based on the teachers' request. For this reason, no photos were provided in this section.

Table 3.20. *A private teachers’ room*

School	Space	Picture
Ankara High School	Subject-matter teachers’ room	

Since computer lessons were compulsory in middle schools, the middle schools visited had a computer classroom as well as a computer teacher (see Table 3.21). There was no computer class in primary school and it was an elective course in high school. Thus, while there was not a particular room for computers in primary school, there was one small computer room in the high school visited (see Table 3.21). However, the high school did not have a computer teacher who was permanently employed. After the resignation of the permanent computer teacher, a substitute teacher was appointed by the Ministry of National Education (MoNE) for a short period of time every year.

At high school, these substitute teachers who were interviewed were computer coordinator teachers. They didn't need to originally graduate from a related educational technology department but they had to complete and succeed in necessary courses and trainings mandated by MoNE. For example, one of them was graduated from Technology and Design Department, while the other one was graduated from Department of Handicrafts. Moreover, the main purpose of computer coordinator teachers was helping other teachers in the process of ICT integration into learning and teaching activities.

Table 3.21. *Overview of technology-enabled classes*

School	Definition	Picture
Yahyalar Durali Bezci Middle School	Library used as a classroom	
	Computer room	

School	Definition	Picture
Keçiören Atatürk Middle School	During a computer lesson	
Ankara High School	A small computer room, while a computer coordinator teacher was on duty	

In some schools, there was a smart board in the teachers' room as a result of the FATIH project, while in some schools there was a difficulty in getting even a photocopy machine for the teachers’ room. Although schools were generally similar in terms of physical infrastructure, there were some differences in terms of technological infrastructure. Technology integration into education wasn’t the most important goal of the school due to insufficient structural issues of the schools and different priorities. In the visited schools, although teachers and administrators were concerned with educational technology use, the investments made were not primarily related to the development of the technology infrastructure. Because, of the allocated budgets were not adequate even for meeting the basic needs of the school’s physical infrastructure and the basic student needs.

The technology that was owned by the schools was not shared much with both the students and the other teachers at the schools. In the middle schools, computer classes were mostly locked when there was no lesson or when it was the break time. Because, students and teachers could harm the computers and components of computers. On the other hand, in the high school, the small computer room was left open for the use of the students. However, the use of interactive smart boards was restricted by the teachers on the breaks due to the security issues. Students were trying to reach unsafe content through it. Moreover, they were constantly trying to cross the limitations set by MoE regarding the use of tablets, internet and applications.

Classroom Settings

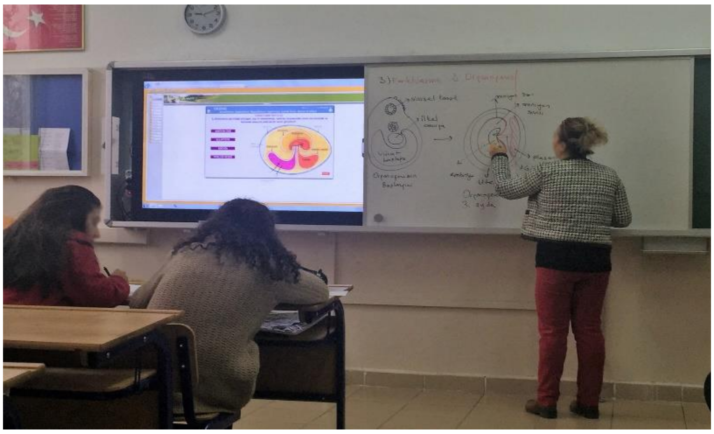
In most of the visited classrooms, a display device was provided by teachers, parents-school associations (PSA) or the school. Display devices in the classrooms included an overhead projector, an LCD projector or an interactive smartboard (see Table 3.22). However, at Yahyalar Durali Bezci Middle School, there were LCD projectors in the classrooms but a laptop or desktop computer was not provided. Thus, the projectors unfortunately stayed idle in these classrooms (see Table 3.22). In the same school, the social studies teacher used the library because it was where the computer with a projector was located. But, this teacher did not really want to share this class with the other teachers. The technology was not accessible by everyone.

Table 3.22. *Example photos about the use of display devices*

School	Definition	Picture
Yahyalar Durali Bezci Elementary School	Use of LCD projector	
Yahyalar Durali Bezci Middle School	LCD projector without a computer connection at a Science Lesson	
	Social studies lesson in the library that contained a computer and a projector	

In Turkey, infrastructure and technological tools in the classrooms had varied widely, depending on whether the school was under the scope of FATIH project or not. In the classes of schools within the scope of the Fatih project, the smart board was definitely available. Students had tablet PCs as well. On the other hand, there was no guarantee that a projector or a computer would be available in the classroom of non-project schools (see Table 3.23). This availability was dependent on the school management's priorities, the teacher's particular effort, and the donation of parent-teacher association.

Table 3.23. *Example photos of classrooms within and outside of the scope of FATIH project*

School	Definition	Picture
Ankara High School (Anatolian)	Availability of Smart Board in a classroom within the scope of FATIH project	
Yahyalar Durali Bezci Elementary School	Teacher’s personal laptop and projector in a classroom, FATIH project was not implemented in this school	

3.5. Selection Strategies of Participants and the Participants

3.5.1. The Selection of Participants

Interviewees were selected through purposeful (or purposive) sampling technique. The technique was determined in parallel to the main objective of the study. Thus, criterion specified (non-probability) rather than random (probability) sampling was employed. As purposeful sampling focuses on selecting information rich cases and key informants (Miles & Huberman, 1994; Patton, 2002; Ritchie & Lewis, 2003), this strategy also helped to determine the participants of the study. Moreover, the participants who can provide great amount of fundamental and important information related to issues to be investigated in the study are described as rich cases (Patton, 2002), once again, this strategy helped to gather the necessary data from participants. Additionally, in this study, snowball/chain sampling method (Miles & Huberman, 1994; Patton, 2002) was applied in order to locate and select the information-rich key informants which were well-informed/experienced ICT users.

The first step of purposive sampling technique is determining *the selection criteria* of the participants (Merriam, 1998). For this reason, while selecting the participants, four criteria were employed. The first criterion was the involvement in implementation of educational ICT use in classrooms. Informants who were an important part of the process were sought. Second criterion was the diversity of participants. Participants from different schools and cities who could portray the different uses of ICT in practice were contacted. Schools were selected based on the availability and accessibility after getting suggestions from city boards, academics and teachers/principals for the key informants.

The third and fourth criteria were the accessibility and the willingness to participate in the study. In all three cases, contacted informants agreed to take part in the study, though some were difficult to reach and some were reluctant about participating in the interviews. Number of interviewees was determined when no new information was forthcoming from new sampled units (Merriam, 1998). Thus, at the end, the maximum variation of samples was obtained. That was the reason why the cases had not equal but different number of participants.

Teachers, principals, vice principals and ICT coordinators/advisors were interviewed in order to elicit a story about a complex or challenging use of ICT. In this way, interviews would help to understand the experiences of the participants and what their experiences really indicate (Seidman, 2006; Bogdan & Biklen, 2007). Specifically, the participants in this case study were the teachers teaching to students from 1st to 12th graders and principals/vice principals in Turkey, Finland and S. Korea in order to propose a broad understanding of actual use of ICT. Moreover, in order to understand general current situation in the selected schools and countries, use of ICT in classrooms was discussed with principals, scholars and ICT coordinators as well.

Selection of schools

In Turkey, a list of schools that would be visited was formulated after interviewing a Unit Coordinator from the Education Information Network (EBA) at the Ministry of National Education (see Appendix A). The first school visited by the researcher was where the Unit Coordinator used to work as a computer teacher. This high school was the first to implement the 'FATIH' project as a pilot scheme and offered the appropriate physical conditions that could lead to student achievement. After visiting the school and seeking further recommendations, the researcher was able to determine the willingness and availability of the individuals and schools who would participate in the study.

In Finland and S. Korea, schools were initially identified with the help and advice of the professors at the universities that the researcher visited. In Finland, Dr. Eija Kärnä, who was a professor in Special Education in the Faculty of Philosophy at the University of Eastern Finland, guided the researcher through the selection of the proper schools and helped with the networking. She was particularly interested in communicating and interacting with individuals that had severe developmental disabilities and autism spectrum disorders and she was also interested in technology for individuals with special needs. Since she was involved in some technology integration process in a special education school and investigated the potential opportunities that the technology offered for the individuals with special needs, she knew the teachers and administrators who had a special interest in technology at the schools in Joensuu. Therefore, she was able to provide help for the selection of participants and their schools in accordance with the sample selection criteria of the study. In Finland, not surprisingly, teacher training schools attached to the universities were visited in both Joensuu and Savonlinna. Both were pioneering schools that had well developed communication and collaboration with the universities.

In S. Korea, Dr. Myunghui Hong, who was a professor in the Department of Computer Education at Seoul National University of Education, helped the researcher to meet the people to cooperate with for the sake of study. His interests were in the areas of computer education and multimedia. He made it possible for the researcher to reach the appropriate participants and schools. Especially he facilitated the access to computer teachers who were previously his students. However, the first S. Korean schools and participants were identified not only with the help of university professor's, but also through the personal efforts of the researcher. Gaining access to teachers and schools was particularly difficult in S. Korea.

3.5.2. Qualitative Sample Size

The qualitative sample size needed to be large enough in order to adequately identify teachers' ICT use at classroom level and provide sufficient data to address the research questions in this study. The sample size of qualitative study was determined by the realization of data saturation. According to Guest, Bunce and Johnson (2006), the saturation occurs when no additional information or perspective is generated by adding more participants to the study. Although there is not a one-size-fits-all method to attain data saturation, rich and thick data as well as data triangulation strategies can ensure the data saturation (Fusch & Ness, 2015).

There is no consensus regarding what the optimal number of participants for obtaining rich and thick data in qualitative research. The number of participants that provide data saturation may vary for each study. For instance, data saturation can be reached by as few as 6 interviews (Guest et al., 2006) or as many as 30 (Creswell, 1998). These numbers may help the researcher to determine the estimated number of participants, but ultimately the desired number of participants should be rely upon the time that saturation is reached. Similarly, according to Bernard (2012), the number of interviews required to ensure data saturation in a qualitative research is not something quantified, but this number is related to the continuation of data collection until the researcher receives all the answers. Therefore, the attainment of data saturation is "a subjective, non-linear, gradual, and unfixed process" (Aldiabat & Le Navenec, 2018; p. 255).

Making generalizations to a larger population of interest was not a characteristic of this study, since the qualitative methodology was employed to gain in-depth understanding of experiences and opinions of the people interviewed regarding teachers' ICT use. However, explaining how to determine the required number of interviews to gain this understanding was important for developing a rigorous methodology. Therefore, in the process of collecting sufficient and high quality data to support the study in each case, the decision to terminate the interviews was taken regarding conceptual depth resulted from iterative approach to data collection and analysis (Saunders et al., 2018). Practical issues was not neglected as well. The researcher kept collecting data and doing analysis up to a point where she observed that no new information was derived out of gathered data rather than just setting a certain number of people to be interviewed just at the beginning of the study. Thus, in the current study, the number of participants were different in each case. The number and variety of participants' schools varied depending on their availability and accessibility. Additionally, in order to support the concept of data saturation, data triangulation strategies were reported in detail in the following sections.

3.5.3. Participants of the Study

In the study, data were collected from 3 different cases in 3 different countries. The data were obtained from 19 Finnish participants from 7 different school, 20 S. Korean participants from 11 different school and 21 Turkish participants from 4 different schools. Each case had different number of participants, because data were collected from each case until receiving repetitive answers to the interview questions and not gathering any new information related to the issues.

Limited universe of the study included teachers, administrators and ICT advisors of public primary, middle and high schools in each country regardless of their teaching subject. The teaching subjects of teachers were not considered or categorized while collecting data in order to ensure data diversity and provide a broad sense of understanding of ICT use in the classroom environment. This helped to improve data saturation.

Finland

In Finland, data were collected from 19 participants in total. Among these 19 participants, five of them were principals, one was an ICT advisor, and the rest was teachers. One of the teachers was also on of the ICT board members of the city. Nine of these participants were female while ten of them were male. Their ages ranged from 29 to 66 and the average age of participants was 43.63.

Additionally, 15 of the participants had master’s degree, 3 of them had Ph.D. degree and only one of them had licentiate’s degree. More details about participants are presented in Table 3.24 below.

Table 3.24. *Finnish Participants*

#	School	School Type	#	Code	Subject	Grade	Date	Duration of the Interview (min)	Duration of Observation (min)	Observed Lessons	Descriptive
1.	Joensuun Normaalikoulu	Training School 1-12	1.	F1	Math	1-6 7-12	02.10 .2014	63	75 x 2	Math	M, 41, PhD
			2.	F2	Classroom Teacher, ICT, Handcraft	5.	09.10 .2014	70	45 x 4	Finnish Religion ICT Lesson (Programming) Physical Edu. History	M, 42, Master
			3.	F3	Principal	-	09.20 .2014	26	-	-	M, 66, Licentiate of education (between MSc and PhD)
2.	Joensuun Lyseon Lukio	High School 10-11-12	4.	F4	Geography	10-11-12	01.12 .2014	51	75 x 1	Geography	M,29, Master
			5.	F5	Biology, geography, health education, ICT Coordinator	10-11-12	21.10 .2014	70	75 x 1	Health Science	F, 35, Master
3.	Nepenmäen koulu	Primary School 1-6	6.	F6	The Finnish language, Mathematics, Psychology	1-2-3-4-5-6	09.12 .2014	84	45 x 1	Finnish Language	M, 46, Master
			7.	F7	Principal	-	26.11 .2014	60	-	-	M, 47, PhD

#	School	School Type	#	Code	Subject	Grade	Date	Duration of the Interview (min)	Duration of Observation (min)	Observed Lessons	Descriptive
4.	Pataluodon Koulu	Elementary School 7 - 9	8.	F8	History, ICT, Media, The Finnish language course, Ethics	7-8-9	08.12 .2014	57	45 x 3	History Computer Science Lesson Social Studies	M, 40, Master
			9.	F9	Principal	-	10.12 .2014	26	-	-	F, 55, Master
5.	Noljakan Koulu	Primary School 1-6	10.	F10	Classroom Teacher, ICT	1-2-3-4-5-6	19.11 .2014	34	45 x 2	Religion & Ethic Art	F, 48, Master
			11.	F11	Classroom Teacher-English-Music-Physical education	1-2-3-4-5-6	21.11 .2014	55	45 x 3	Math Finish English	F, 43, Master
6.	Savonlinna Normaalikoulu	Training School 1-12	12.	F12	Principal	-	28.10 .2014	60	-	-	F, 45, PhD
			13.	F13	Classroom Teacher, Special Education, English	1-2-3-4-5-6	27.10 .2014	60	45 x 1	English	F, 41, Master
			14.	F14	Classroom teacher and Home economics	1-2-3-4-5-6-7	31.10 .2014	47	45 x 2	Finish Math (1. Grade)	F, 33, Master
			15.	F15	IT Engineer and ICT advisor	1-9 Technical Advisor	29.10 .2014	56	45 x 1	Google Apps for Education Training	M, 31, Master
7.			16.	F16	Principal	-	30.10 .2014	29	-	-	M, 56, Master

#	School	School Type	#	Code	Subject	Grade	Date	Duration of the Interview (min)	Duration of Observation (min)	Observed Lessons	Descriptive
	Martalan Koulu (Savonlinna)	Savonlinna University Practice School	17.	F17	Music	5-6-7-8-9	30.10 .2014	46	45 x 2	Music	F, 52, Master
			18.	F18	Physics, ICT	7-8-9	30.10 .2014	31	45 x 1	Math	M, 38, Master
		Lower stage of comprehensive school (i.e. classes 1-9)	19.	F19	Physics, Mathematics and Chemistry, ICT	5-6-7-8-9	29.10 .2014	76	45 x 1	Math	F, 41, Master
7 Schools in 2 Cities (Joensuu & Savonlinna) in North Karelia Region in the province of Eastern Finland		3 Training School 2 Primary School 1 Elementary School 1 High School			5 Classroom T. 5 Principals 5 ICT jointed subject 3 Mathematics 2 Geography 2 The Finnish Language 2 English 2 Music 2 Physics 1 Biology/ Health Education / Phycology / Handcraft/ History / Media/ Ethics / Physical Edu. / Special Edu. / Home Economics / IT Engineer/ Chemistry	From 1 grade to 12 grade	In 4 months	-1001 min -16.68 hours	1245 (20.75 hours)	+ Spending time at the school with teachers and students. + Observation Sheets + Pictures	-19 participants Aged btwn 29 and 66 Average age is 43.63 -9 Female & 10 Male -15 Master Degree -3 PhD -1 Licentiate of education

S. Korea

In S. Korea, data were collected from 20 participants in total. Among these 20 participants, five of them were principals and the rest were teachers. Thirteen of these participants were female while seven of them were male. Their ages ranged from 27 to 62 and the average age of participants was 40.15.

Additionally, 10 of the participants had master's degree, one of them had Ph.D. degree and nine of them only had bachelor's degree. More details about participants are presented in Table 3.25 below.

Table 3.25. *S. Korean Participants*

#	School	School Type	#	Code	Subject	Grade (6+3+3)	Date	Duration of the Interview (min)	Duration of Observation (min)	Observed Lessons	Descriptive
1.	Kaewoong Middle School	7-8-9	1.	K1	Principal	-	14.04. 2015	22	Simultaneous translation in English	-	F, 55, Master
			2.	K2	Math	9.grade	14.04. 2015	56	45 x 1 Simultaneous translation in English	Math	M, 31, Bachelor
2.	Girls Middle School	7-8-9	3.	K3	Math	7.grade	20.05. 2015	43	45 x 1 In English	Math	F, 35, Master
3.	Buksung Elementary School	1-2-3-4-5-6	4.	K4	Classroom	6.grade	15.05. 2015	100	45 x 1 Simultaneous translation in Turkish	Science	M,40, Master
			5.	K5	Principal	-	15.05. 2015	27	Simultaneous translation in Turkish	-	M,52, Master
4.	Yeouido Middle School (Seoul)	7-8-9	6.	K6	Principal	-	-	42	Simultaneous translation in English		M,58, Master
			7.	K7	Computer	K9		e-mail	15 x 1 In Korean	Technology Lesson	M,33, Bachelor
			8.	K8	English	K9		e-mail	15 x 1 In Korean	English	F,34, Master
			9.	K9	Korean	K9		e-mail	30 x 1 In Korean	S. Korean Lesson	F,30, Bachelor
5.	Seoul Sinmok Elementary School	1-2-3-4-5-6	10.	K10	Computer Science Education	6grade	23.04. 2015	e-mail	In English	-	F, 40, PhD
6.			11.	K11	Classroom	1.grade		e-mail	In S. Korean	History	F,40, Bachelor

#	School	School Type	#	Code	Subject	Grade (6+3+3)	Date	Duration of the Interview (min)	Duration of Observation (min)	Observed Lessons	Descriptive
	Yu-Hyeon Elementary school	1-2-3-4-5-6	12.	K12	Principal	-		e-mail	In Korean	-	F,62, Master
7.	Seoul Hwagok Elementary School	1-2-3-4-5-6	13.	K13	Computer	4.grade		e-mail	In English	Computer	F,37, Master
			14.	K14	Principal	-		e-mail	In Korean	-	M,60, Bachelor
			15.	K15	Classroom	4.grade		e-mail	In Korean	Math	F,27, Bachelor
8.	Ga-gyung Middle School	7-8-9	16.	K16	Science	7.grade	10.06.2015	e-mail	In Korean		M,32, Bachelor
9.	Incheon Wondang Middle School	7-8-9	17.	K17	English	3. grade	18.07.2015	e-mail	45 x 1 In Korean	English	F, 37, Master
10.	Young Jong Middle School	7-8-9	18.	K18	English	7-8-9	16.07.2015	e-mail	In English	x	F, 32, Master
			19.	K19	Social Science	8.grade	15.04.2015	e-mail	45 x 1 In Korean	Geography	F, 35, Bachelor
11.	Chungbuk High School	10-11-12	20.	K20	English	10.grade	18.07.2015	e-mail	In Korean	x	F, 33, Bachelor
11 Schools in 3 Cities (Seoul, Incheon & Chungbuk)		4 Elementary School 6 Middle School 1 High School	-5 Principals -4 English -2 Math -3 Classroom -2 Computer -1 Computer & Science -1 Korean Language -1 Science -1 Social Science			From 1 grade to 12 grade	In 4 months	-290 min -4.83 hours -14 emails	285 (4.75 hours) In each school, appx. 4 hours spent	+ Spending time at the school with teachers and students. +Observation Sheets + Pictures	-20 participants Aged btwn 27 and 62 Average age is 40.15 -13 Female & 7 Male -9 Bachelor -10 Master Degree -1 PhD

Turkey

In Turkey, data were collected from 21 participants in total. Among these 21 participants, four of them were vice principals, one was a principal, and the rest were teachers. One of the teachers also was working as the unit coordinator of Education Information Network (EBA) at Republic of Turkey Ministry of National Education. Eleven of these participants were female while ten of them were male. Their ages ranged from 29 to 56 and the average age of participants was 42.05.

Additionally, only one of the participants had master's degree and the rest had a bachelor's degree. More details about participants are presented in Table 3.26 below. Table 3.27 presents summary of participants' descriptive information.

Table 3.26. *Turkish Participants*

#	School	School Type	#	Code	Subject	Grade Level	Date	Duration of the Interview (min)	Duration of Observation (min)	Observed Lessons	Descriptive
1	Ankara High School (Anatolian)	High School 9-10-11-12	1.	T1	Information Technologies	9	20.01.2014	45	-	-	F, 42, Bachelor
			2.	T2	Vice Principal	-	06.02.2014	33	-	-	F, 50, Bachelor
			3.	T3	Vice Principal	-	06.02.2014	16		-	M, 56, Bachelor
			4.	T4	Mathematics	9-10-11-12	19.01.2015	68	40 x 2	11.grade	M, 46, Bachelor
			5.	T5	Biology	9-10-11-12	19.01.2015	29	40 x 1	10.grade	F, 42, Bachelor
			6.	T6	English	9-10-11-12	18.12.2015	50	-	-	F, 40, Bachelor
			7.	T7	Religion and Ethics	9-10-11-12	23.12.2015	39	40 x 1	9.grade	M, 49, Bachelor
			8.	T8	Music	9-10-11-12	24.12.2015	37	40 x 2	9.grade	M, 45, Bachelor
			9.	T9	Information Technologies	9	28.12.2015	29	40 x 2	9.grade	F, 49, Bachelor
			10.	T10	Chemistry	10-11	30.12.2015	17	40 x 1	11.grade	F, 48, Bachelor
2	Keçiören Atatürk Elementary School	Elementary School 5-8	11.	T11	Information Technologies	5-6	16.01.2015	65	40 x 2	5.grade 6.grade	F, 29, Bachelor
			12.	T12	English	5-6-7-8-	22.01.2015	29	-	-	F, 41, Bachelor
			13.	T13	Vice Principal	-	05.02.2015	44	-	-	M, 55, Bachelor
3	Durali Bezci Primary	Primary School 1-4	14.	T14	Principal	-	03.02.2015	30			M, 38, Master
			15.	T15	Classroom Teacher	1-2-3-4	21.10.2015	e-mail	40 x 2	1.grade	M, 36, Bachelor
			16.	T16	Classroom Teacher	1-2-3-4	21.10.2015	e-mail	40 x 2	1.grade	M, 36, Bachelor
			17.	T17	Vice Principal	-	14.12.2015	16	-	-	M, 36, Bachelor
4	Durali Bezci	Elementary School	18.	T18	Science & Technology	5-6-7-8	22.10.2015	37	40 x 2	8.grade	F, 36, Bachelor

#	School	School Type	#	Code	Subject	Grade Level	Date	Duration of the Interview (min)	Duration of Observation (min)	Observed Lessons	Descriptive
	Elementary School	5-8	19.	T19	Social Sciences	5-6-7-8	01.12.2015	22	40 x 2	7.grade	F, 45, Bachelor
			20.	T20	ICT Teacher	5-6 7 (elective)	09.12.2015	17	40 x 2	6.grade	F, 32, Bachelor
5	Directorate General for Innovation and Education		21.	T21	The Unit Coordinator of Education Information Network (EBA) at Republic of Turkey Ministry of National Education		19.02.2015	44	-	-	M, 32, Bachelor
4 Schools 1 Ministry of Education in Ankara, the capital city of Turkey		1 High School 2 Elementary School 1 Primary School	-4 Information Technologies -4 Vice Principal -2 English -2 Classroom Teacher -1 Principal -1 Mathematics -1 Biology -1 Religion and Ethics -1 Music -1 Chemistry -1 Science & Technology -1 Social Sciences -1 Coordinator			From 1 grade to 12 grade	In 4 months	-667 min -11.12 hours -2 emails	920 (15.33 hours)	+ Spending time at the school with teachers and students. + Observation Sheets + Pictures	-21 participants Aged btwn 29 and 56 Average age is 42.05 -11 Female & 10 Male -20 Bachelor -1 Master Degree

Table 3.27. *Summary of Participants' Descriptive Information*

Country	# of Participants	Participants	Gender Distribution of Participants	Age Group of Participants	Average age	Education Level	# of Schools Visited in Each Country	School Provinces
Finland	19*	12 Teachers 1 IT Engineer 1 Coordinator 5 Principals	9 Female 10 Male	between 29 and 66	43.63	15 Master's Degree 3 PhD 1 Licentiate of Education	7 Schools*	in 2 Cities (Joensuu & Savonlinna) in North Karelia Region in the province of Eastern Finland
S. Korea	20*/**	15 Teachers 5 Principals	13 Female 7 Male	between 27 and 62	40.15	9 Bachelor's Degree 10 Master's Degree 1 PhD	11 Schools*	in 3 Cities (Seoul, Incheon & Chungbuk)
Turkey	21*/***	15 Teachers 4 Vice Principals 1 Principal 1 Coordinator	11 Female 10 Male	between 29 and 56	42.05	20 Bachelor's Degree 1 Master's Degree	4 Schools* 1 Ministry of Education*	in Ankara, the capital city of Turkey

*Available schools and teachers, voluntary participation, respondent-driven participants and schools.

** 14 of them provided data through e-mail.

*** 2 of them provided data through e-mail.

3.6. Instruments and Sources of Data

3.6.1. Overview of the Instruments

Case studies require a wide range of evidence such as direct observation results, interviews with participants, documentary records (e.g., documents detailing actions, legislative documents, media reports), artifacts, and secondary analysis of others' research (Yin, 2009) to be able to provide a holistic and detailed description of a phenomenon or to answer the questions why and how something happened.

Due to this requirement and in terms of the purpose of the study, the main data source for data collection was the interviews with the key actors (teachers, administrators and ICT advisors/coordinators) within the context of ICT use in the teaching-learning process at the classroom level. Furthermore, field and observation notes, photos in the classrooms and schools were taken to support the data collected with the interviews. Additionally documents such as ICT strategy booklets of schools, local curriculums, school brochures, lesson plans and schedules were obtained from visited schools. Table 3.28 shows the summary of the data sources.

Table 3.28. *Summary of the Data Sources*

#	Data Sources	Definition	Purpose
1.	Interviews	• Semi-structured interviews with the key actors (teachers, administrators and ICT advisors/coordinators). ıterview protocols were prepared. • A pilot study for the interviews was conducted with the help of cognitive debriefing technique.	An opportunity to gain deep information about the phenomena being investigated.
2.	Field and observation notes, photos	• Direct observations were made less formally throughout field visits. • Multiple observers were involved in the process whenever they were available in order to increase the reliability of observational evidences.	They were taken to support the interview data in the classrooms and schools.
3.	Documents	• Document were consisted of ICT strategy booklets of schools, local curriculums, school brochures, lesson plans and schedules which were obtained from visited schools.	They were used as a way of verifying the data coming from interviews and observations. They

#	Data Sources	Definition	Purpose
		• Previous studies on policies, curriculums, ICT strategy documents, statistical yearbooks and reports published by international organizations were utilized to enrich the information about the case and supplement data obtained through interviews.	also helped researcher to bridge the gaps left by the respondents.

3.6.1.1. Interviews

The study employed semi-structured interviews as the main instrument for data collection (Bogdan & Biklen, 1998). This approach was selected, because it provided the researcher with considerable flexibility to probe the views and opinions of the participants and gave the researcher an opportunity to gain deep information about the phenomena being investigated (Corbetta, 2003). Moreover, the meaning of participants' experiences were provided with the help of interviews (Seidman, 2006; Bogdan & Biklen, 2007).

3.6.1.1.1. Interview Protocols

Interview protocols help a researcher to plan and make effective use of the allotted interview time. More importantly, the development of questions, the prioritization of their order and making decisions about what information would be important for the purpose of study are framed by the interview protocols (Patton, 2002). In this study, the semi-structured interview protocols allowed the researcher to organize interviews in a focused and tailored manner according to the characteristics and requirements of a wide range of informants relevant to various contexts.

A separate interview protocol was prepared for teachers and administrators in Turkish, English and Korean languages for researcher to keep control over the interviews, timing, concept and main purpose of the study (Rubin & Rubin, 2012). The questions and content of the protocols for participants were reviewed by two experts in the field of Instructional Technology (see Appendix B). According to the feedbacks provided, 5 questions were rewritten due to unclear or conflicting meaning of them and two questions were merged into one in order to ask a more general question. Moreover, research questions, the purpose and a short summary of the study were added in the protocols so that more focused answers and information could be gathered from participants.

In Turkey, Turkish interview protocols were employed after revisions. In Finland, since all teachers and administrators were able to communicate in English, the interviews were executed in English. For the English interview protocol, an English language expert reviewed language of the interview and an Instructional Technology expert from Philosophical Faculty at Eastern Finland University examined the content of the questions again. While there was no major change in the content, minor corrections were made in the language protocols.

English version of the interview questions was translated into Korean by a content expert of Instructional Technology from Department of Computer Education at Seoul National University of Education. After that, all questions were revived once again with a Turkish- Korean language expert in order to ensure that the meanings of the questions remain the same. That was because in S. Korea, some interviews were conducted with the help of an English- Korean translator or Turkish- Korean translator.

The interviews were created for teachers and administrators in primary, lower and upper secondary schools in order to explore the use of ICT in practice by focusing at classroom level without neglecting the national and school levels issues. Since a Multi-level Ecological Perspective (Zhao & Frank, 2003) was adopted to describe context and boundaries of the study (see Figure 3.2), the interview questions were prepared accordingly.

Based on the conceptual framework and literature review, the interview questions were generated under three main sections. That was because factors affecting ICT use in educational context were grouped at 3 levels in an adopted perspective. They were Macro, Meso and Micro levels. Macro level covered variables related to education system such as national curriculum, Meso level included school-related factors such as ICT infrastructure and Micro level focused on variables related to issues which enable and hinder pedagogical use of ICT in the classroom.

The protocols started with an introduction part which included research title, research questions, aim of the study and voluntary participation form (see Appendix B). The introduction part also pointed out anonymity and confidentiality of participants as well as their interview records. Moreover, the participants were informed that the interviews would be audio-recorded and these audio recordings would be converted into verbatim transcripts. Prior to the steps of using verbatim transcripts as a data source for the study, the principle of voluntary participation and the right to terminate the interview at any time were reminded to the participants. If the participants didn't have any other question related to interview, they were kindly asked to sign voluntary participation form with great gratitude for their participation.

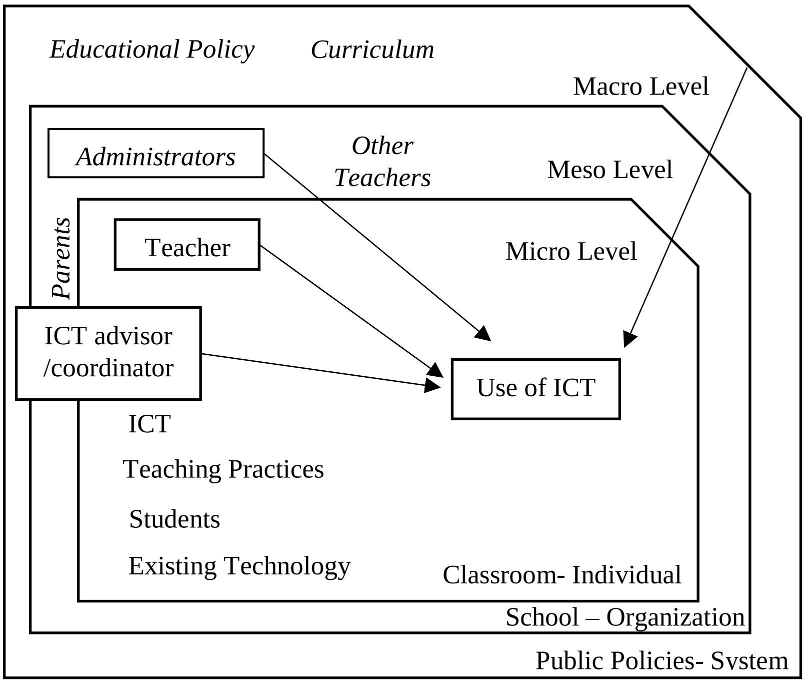


Figure 3.2. Conceptual Framework of Use of ICT in Practice from a Multi-level Ecological Perspective. Adapted from “Factors affecting technology uses in schools: An ecological perspective”, by Y. Zhao and K. Frank, 2003, American Educational Research Journal, 40(4), p.807-840. Adapted with permission.

The interview questions

The teachers were asked a total of 33 main questions and 8 sub-questions, while the administrators were asked a total of 18 main questions and 11 sub-questions. All questions in the interview protocols were open-ended. In both interview protocols, the introduction part was followed by a part that help to gather descriptive information of participants.

Teachers were asked 7 questions including age, gender, last graduation (highest level of education, bachelor’s degree, master’s degree or Ph.D.), subject area, teaching grade level, whether or not they had an administrative duty at school and lastly about ICT-related trainings taken by them within the descriptive information part. With the help of these questions, information was gathered about the teachers' individual background.

After introduction and establishment of the descriptive parts of interview protocol, the rest of the questions were grouped under three sections. These three sections were named as organizational level issues which referred to Macro level issues, school level issues which specified Meso level issues and classroom level issues which sought information about Micro level issues.

The first section of the interview protocol, organizational level, consisted six main and one sub-questions related to national and school level policies on the use of ICT and their implementation into teaching and learning processes to form a better understanding of the participants' perspective about educational policies, curriculum and how they made the connection between policies and their practical uses. Moreover, teachers were asked to describe the relationship between the use of ICT and teaching and learning processes in order to reveal their understanding regarding the main focus of the study. To learn what they think about in-service training, types of ICT-related in-service trainings that were provided for them and how taking these trainings changed their ICT use were questioned. In order not to neglect the fact of teacher training in education, a question asked to investigate how teacher trainings in their country supported ICT use in education.

The second section, school level, included 8 main and 6 sub-questions related to status of the current infrastructure and its maintenance, required infrastructure components to implement ICT-related policies better, school-level ICT strategies, role of administrators for ICT integration, collaboration of teachers and ICT-related subjects and skills. The purpose of questions asked under this section was to gather in-depth information about school-culture, administrative issues and accessibility to technology. Sub-questions were used as probes for further elaboration on the given answers (Creswell, 2013).

The third section, classroom level, included 12 main questions and 1 sub-question to investigate teachers' perception of ICT use in the classroom environment and their ICT use practices. Moreover, the questions sought for teachers' perception related to their source of motivation to use ICT and their role while utilizing ICT in the classroom. Barriers and enablers for integrating ICT into education, advantages and disadvantages of ICT use were also asked to understand the context of ICT use.

The interview protocol for administrators were the same for the introduction part and slightly different for the descriptive information section. Administrators were asked only first 5 questions of descriptive questions established for teachers. The questions were grouped under two sections instead of three. The classroom level wasn't included in interviews of administers. However, questions related to educational ICT use in the classroom were blended into these two sections.

The organizational level part of administrators' interview protocol had 6 main questions and 5 sub-questions in order to find out about their perceptions of national/school level policies and the way of their implementation as well as ICT-related definitions in the current curriculum. Furthermore, ICT-related in-service trainings, their content and their planning process were asked to learn more about actual implementation of in-service training policies. Information about elective or compulsory ICT-related courses developed for students was also obtained.

The school level part included 7 main questions and 6 sub-questions to reveal school-level ICT-related strategies, their implementation and their perception of ICT use in the school. The role of administrators in the context of educational ICT use, types of collaboration between teachers for the new way of teaching with ICT were also questioned to gain further understanding about school culture.

At the end of the interviews, all participants were given a chance to provide further information related to research questions, to comment and ask questions freely. They were asked to write down their e-mails in order to request their confirmation on the transcribed data to ensure data reliability/validity. Additionally, all interviewees received researcher's appreciation for their help and understanding and foreign and local participants were given a small gift from Turkey to show the appreciation.

Finally, end time of the interviews and codes assigned to the participants were noted at the end of each interview.

3.6.1.1.2. A Pilot Study for the Interviews

Pilot testing of interview questions on a small group is a process of identifying possible issues and making changes in the interview protocol based on feedbacks in order to clarify the content of the interview and discover its practicality and feasibility (Creswell, 2009). A cognitive debriefing technique was used to conduct interviews with 4 participants for evaluating feasibility of proposed research protocol, eliminating ambiguous and leading questions and improving adequacy, relevance and clarity of the questions (Beatty & Willis, 2007).

To accomplish these mentioned goals, one female and one male participants from Turkey, one male participant from Finland and one female participant from S. Korea were interviewed and the data obtained were not included in the actual data. The participants for cognitive debriefing were selected by considering different genders, subject areas and their knowledge related to ICT use.

While performing the cognitive debriefing technique to test whether the questions were really understood as the researcher would like to ask, a think-aloud process was adopted (Willis, 2005). With the help of the think-aloud process, the participants were encouraged to put their thoughts into words as they were trying to answer the questions. In this way, increasing the reliability and validity of the interview protocol was aimed. While applying the same process to each question, the participants were asked whether the meaning of the questions was clear and there were any questions that bothered them.

The interviews lasted for more than 75 minutes for each pilot study participant which was longer than the researcher expected. Based on the length of interviews and cognitive debriefing process, the structure of some sentences was changed because either the meaning of them was not clear in different languages or they had spelling and wording mistakes. Some of the questions were abbreviated in order not to cause interviews take very much time than planned. Additionally, some of the sub-questions were modified to get richer responses from the participants.

After completing the pilot tests, the questions and the protocol were re-examined and finalized by the researcher. The finalized interview protocol was shared with two experts from Turkey, an expert from Finland and S. Korea. Based on reviews and edits of experts, the interview protocol was corrected again and was made ready for data collection process.

3.6.1.2. Direct observations, Field Notes and Photos

A case study should be conducted in the natural context of the case and this allows collection of relevant data through direct observations in the natural setting (Yin, 2009). Observations can provide another source of evidence for phenomenon or environmental condition related behaviors in case studies. Observations may include the physical setting itself, the participant, activities and interactions, conversations, subtle factors (less obvious but most probably important evidences such as symbolic meaning of words) and researcher's behaviors as part of the scene (Merriam, 1998). Therefore, additional information about the research topic allows researcher to understand context and potential issues better. In this study, educational use of ICT by teachers and students in the classrooms were the focus of informal direct observations, however in order to observe from a broader setting, ICT use in the schools were observed too. Other foreigner researchers, that were available at the visited universities, were involved in the study as the observers. Even though the observations were made with an informal manner, a structure that should be taken into consideration was created in order to also steer these other observers accordingly. This way, every observer followed the same set of instructions and observation pathway in order to ensure a standard approach among the observers. However, the scope of observations were not necessarily limited to this structure created. Appendix C presents the structure for the observations and exemplary pages of actual observation notebook.

Direct observation can be performed as a formal or casual data collection process (Yin, 2009). In other words, the researcher may prefer to prepare an observation protocol and examine occurrences of certain behaviors or the researcher might make observations during a field visit or while collecting other data required for the study. In this study, direct observations were made less formally throughout field visits. The behaviors, interactions and other occurrences which were analogous to the interview transcripts taken as field notes. Furthermore, when other researchers were available during observations, they were asked to observe classrooms together to ensure multiple observers in order to increase reliability of observational evidences.

Taking photographs in the natural context of the case can also provide important case features in addition to observations made (Yin, 2009). Photographs are valuable evidences for not only the observer but also other people rather than the observer. Thus, some pictures of classrooms and schools were specifically taken in order to show characteristics of classrooms and to describe important activities and interactions related to ICT use. Required permissions were obtained to take photos.

3.6.1.3. Documents

A variety of written and printed materials such as books, newspaper articles, brochures, government documents, journals and public records can be analyzed as documents. Documents can be classified under there groups: Public records, personal documents and physical evidence (O’Leary, 2014). Available documents can be reviewed for background knowledge about the study before the process of investigation and interviews begin, as well as during and after the study (Lechuga, 2006; Bowen, 2009). During the process of research, the documents such as tables, graphs or any kind of written artifacts might be created by the researcher or the participants too.

Examination of documents provides additional data for other data sources, in this case for interviews and direct observations. Gathering data about the same phenomenon from different sources is helpful to ensure the credibility of research data (Bowen, 2009). Therefore, in this study, as the third data source of the study, documents provided additional insight into use of ICT in the classrooms in different countries and were useful for triangulating the findings.

The documents also offer different perspectives and dimensions in terms of understanding the context and participants' perception related to the case (Lechuga, 2006). Moreover, they provide an alternative aspect of the phenomenon that may not be mentioned during the interviews (Marshall & Rossman, 1999, Lechuga, 2006; Yin, 2011). In line with the purpose of this study, public records that are the official documents and information generated by the organizations for documentation and distribution purposes such as policy manuals, ICT strategy documents of schools and annual reports were collected to create a basis for the formation of a general understanding of the cases. Additionally, physical evidences that are found within the setting of the study such as lesson materials, handbooks and posters were also included in the documents to provide more information regarding the educational use of ICT.

Along with public records and physical evidences of implementation of educational ICT, previous studies on policies, curriculums, ICT strategy documents, statistic yearbooks and reports published by international organizations were utilized to enrich the collected information about the case and supplement data obtained through interviews. Documents were analyzed for their literal meaning from an interpretive point of view.

In the end, a large collection of documents were reached. These documents produced valuable information about the context and the ICT use of teachers/principals and their perceptions towards educational use of ICT. Moreover, they helped to verify the data coming from interviews and observations and formed a bridge helping to over come the gaps left by the respondents regarding the general understanding of ICT use.

3.7. Data Collection

In the study, the data were collected through in-depth interviews, informal direct observations and with the help of the documents in Turkey, Finland and S. Korea consecutively. Using these instruments, actual use of ICT in the classroom environment in different countries was tried to be investigated. Following part presents the data collection process.

The Research Permits

Once the data collection instruments were ready to use after reviews and corrections, permission of the Ethics Committee was necessary to obtain in order to conduct the research and start collecting data in Turkey. For this reason, interview protocol, voluntary participation form and information form containing the purpose and summary of the research were examined by the Institutional Review Board (IRB), namely METU Applied Ethics Research Center. After the IRB approval was granted, METU Registrar's Office directly sent the approval document and the list of schools to be investigated to Ministry of National Education (MoNE) for a research permit so that the data collection process could be implemented in selected public schools freely. When the research permit was approved by MoNE, District National Education Directorates were informed about the research and a permission form was sent to the researcher (see Appendix D).

The research was financed by The Finnish National Agency for Education in Finland. To receive the Finnish Government Scholarship (CIMO scholarship), a successful application was made to MoNE in Turkey. After an interview and oral examination process, the application of the researcher was found qualified to send to the Finnish Government Scholarship Council by MoNE. The final decision on scholarship applications was made by CIMO and the researcher was entitled to receive the scholarship. In the process of qualifying for this scholarship, the interview protocols, data collection instruments and the purpose of the research were reviewed and approved couple times by MoNE and CIMO. Furthermore, as a result of receiving a prestigious scholarship, the researcher also found a chance to become a visiting researcher at University of Eastern Finland in Joensuu. In order to do interviews in the schools in Joensuu City, the professor from University of Eastern Finland who was responsible for the researcher wrote an official letter in English including a permission to conduct the research and made a call in order to encourage the participation to the study (see Appendix D). However, the schools in Savonlinna were required to have a formal permission letter from the City of Savonlinna. Application for this permit was also made by the professor and the permit was issued in Finnish language (See Appendix D).

The researcher was granted and supported by Overseas Research Scholarship Program (2214) of The Scientific and Technological Research Council of Turkey (TUBITAK) for the examination of S. Korean case. Moreover, with the help of MEVLANA Exchange Programme, the researcher was able to continue pursuing related studies in INHA University in Incheon as an exchange student. Additionally, the researcher made connections with the Department of Computer Education at Seoul National University of Education as a visiting researcher. All of these were important developments for the sustainability of the research and to get the initial contact with the S. Korean school. In S. Korea, the necessary permission for school visits was originally attempted to be taken from Seoul Metropolitan Office of Education (SMOE). However, due to an existing requirement for obtaining permission from the principals of each school individually in order to conduct the study, the professor from Seoul National University of Education who was responsible for the researcher wrote an official letter asking principals to participate in the research. The letters were written in S. Korean and issued separately for each school by including specific school names, the purpose of study, the appropriateness of conducting such research and requests addressing the principals and asking for their support to participate in the research project (see the examples of letter in Appendix D).

3.7.1. Qualitative Data Collection

Case studies usually include data collection through interviews, observations and document analysis (Merriam, 1998). The collection of data from several different sources in this way allows the researcher to develop both overall and detailed understanding of the cases. For this reason, in accordance with the purpose of the study, semi-structured and in-depth interviews were conducted, and data were collected from available and voluntary teachers of students in grades ranging from 1 to 12, administrators and ICT advisors/coordinators. Before the interviews, all necessary permissions were obtained. Each interview was scheduled with each participant and managed carefully and meticulously by the researcher who had previous experience in interviewing. Classroom observations were made before or after the interviews according to the availability and readiness of the participants. Activities of each participant at the classroom were observed at least during one in-class teaching period. In some cases, the number of lessons observed in a class varied up to four times.

The evidences from the documents were continuously collected during the research project. The process of data collection was held very interactively and holistically throughout the study. Accordingly, when some activities that would shed light on the investigation were observed on the field, they were kept noted to be discussed later within the interviews, or any interesting point that were encountered within the reviewed documents was also noted and discussed during the interviews (Merriam, 1998). Moreover, three principles of data collection were carefully taken into consideration throughout the study: (1) Using multiple sources of evidence, (2) creating a case study database and (3) maintaining a chain of evidence (Yin, 2009).

3.7.2. Data collection procedure

In Turkey, the schools were selected with the help of an ICT advisor/teacher who was working as the unit coordinator of Education Information Network (EBA) at Republic of Turkey Ministry of National Education. Since he was an experienced computer teacher and working as a coordinator, he had an extensive knowledge about the schools in Ankara, Turkey that would participate in the research and the teachers from these schools who could provide rich information related to ICT use. Based on his advices, a list of schools (see Appendix A) was prepared and sent to MoNE for the approval of school visits. Moreover, when starting the data collection in the listed schools, the teachers and administrators regarded as experienced and knowledgeable and as potential informants for the research were selected among other participants this way for the part of the study conducted in Turkey.

The research in Finland and S. Korea was assisted by local academics who organized and arranged access to appropriate schools where the researcher was able to conduct interviews of respective teaching professionals. Then the researcher contacted the potential interviewees whose names were provided by academics. The contacts of additional potential interviewees were taken through snowball sampling as well. After that, semi-structured interviews were conducted with respondents. As mutually agreed before, the classrooms were observed before or after the interviews.

The researcher held a total of 44 in-depth interviews with participants from public schools in Finland, S. Korea and Turkey. While, each interview with teachers and ICT advisors lasted approximately one hour, the interviews made with administrators took approximately 30 minutes. The interviews took place in a teachers' room, an office, an available classroom or in a spare room within the schools at a mutually agreed time and place.

Teachers, administrators and ICT advisors responded to a standard protocol particularly generated for this study as well as other questions that arose spontaneously in the course of the interview. The interview protocol for teachers and ICT advisors included 33 main and 8 sub open-ended questions designed to elicit information that would provide an in-depth description of actual ICT use in practice. For the same purpose, the protocol for administrators was consisted of 18 main questions and 11 sub-questions. The questions were designed to be rich and detailed in a way to help the researcher to reveal the true meanings of the given answers attributed by the participants. They aimed to bring out very detailed information out of participants so that the researcher was enabled to conclude a holistic view regarding the studied phenomenon supported with the most accurate and comprehensive findings. Participants' way of attributing meanings to the questions asked and the answers given was tried to be discovered in order to ensure a true understanding of ICT use of the participants.

It was important that the interviews took place with a flexible and comfortable manner of communication. Because, the participants could reveal the significant points related to the studied phenomena, which the researcher could not recognize before. The participants were free to talk about what was important to them personally. Therefore, in-depth interviews with a flexible protocol helped exploring the phenomenon within a wider scope.

All participants were informed about anonymity and confidentiality of the data collected before to interviews. The interviews were audio-recorded with the permission of each participants with the help of a smart-phone. The audio recordings of the participants were transcribed and submitted to their approval prior to use in scope of member check technique. In this way, the participants had a chance to review and change the interview transcription and validate the transcription as an accurate record of the interview.

The interview protocol was supported by the notes taken during and after each interview and observations made by the researcher. The interview notes included a summary and a brief indication of key-points of the conversation, discussion, interaction and activity. After the interviews and observations, the notes were reviewed and edited in a period of 30-minutes. These note taking sessions ensured that interviews were fully reflected, made possible to see the themes that started to emerge around interviews and supported in identifying the patterns that began to occur over time.

In Turkey, two out of twenty one participants wanted to answer questions in a written way. They did not accept interview process by claiming that they didn't have time after the researcher observed their classrooms. During the process of member check, one teacher specified that he did not approve the use of audio-recorded interview data based on his verbatim transcription. The data was excluded from the study due to ethical concerns. Moreover, fourteen interviews out of twenty had to be done via e-mail in S. Korea due to teachers, who were observed in the classrooms, not having time or being so shy to actually answer the questions in person. These teachers also claimed that they could read and write English but they wouldn't feel comfortable to communicate in English even if Korean speaking translators were provided. So, these teachers (14 out of 20) preferred to answer questions in written format instead of initiating verbal communication. Moreover, some of these teachers said that they felt uncomfortable to answer the questions because they might give wrong information or possibly get in trouble due to their responses. It was pretty difficult to get the written responses via e-mail from S. Korean teachers. A person possessing a certain authority such as a professor or a principal had to ask them to send the answers via e-mail or hand them back as a printed copy. However, there were still 5 teachers who didn't send the interview documents. The S. Korean participants were the least cooperative participants within the research, whilst Turkish participants had moderate engagement, Finnish participants were the most enthusiastic about their possible contribution to the research.

In the study, there were three cases, and the same data collection procedure was employed for each context holistically. The time was limited to 4 months per studied country which corresponded to a half academic year for each country. First data collection held in Finland, then S. Korea and lastly in Turkey in accordance with the availability of supports and scholarships found and arrangements made for visits. Data collection process was summarized in Figure 3.3.

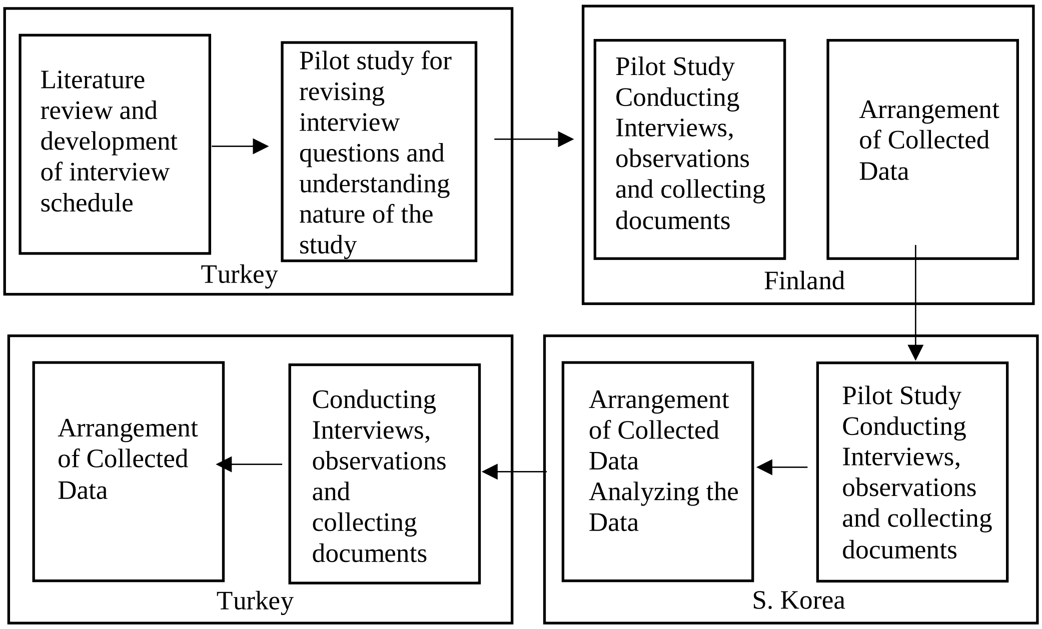


Figure 3.3. Data collection process in Finland, S. Korea and Turkey

3.8. Data Analysis

Data obtained throughout the qualitative research conducted for this study were too big and unstructured due to the nature of the research method employed. A large part of the collected data were in text-based form including interview transcripts, observation and field notes as well as some other related documents. For this reason, this set of big, unstructured and text-based data required to be organized and grouped in a clear way to disclose the findings of the study. In order to achieve this goal, categorizing strategies such as coding and thematic analysis were utilized for data analysis (Braun & Clarke, 2006).

Thematic analysis as one of the qualitative data analysis methods was rigorously carried out by the researcher to determine, interpret and address patterns formed across the data (Braun & Clarke, 2006). The application of an inductive and thematic analysis generated a perspective that was useful in addressing a particular set of research questions. The thematic analysis technique was specifically employed for the study, because it provided flexibility and theoretical freedom in the process of analysis, it was a useful approach for identifying the main features of the large data as well as generating thick descriptions of collected data in order to endorse findings of the study, it helped the researcher to clarify similarities and differences within the data set and it also allowed the researcher to realize understandings that were unforeseen before (Braun & Clarke, 2006).

The shortest and most concise way of analyzing qualitative data was defined as a three-step process: the preparation and transcription of the data, collapsing data chunks into themes and codes, and the conclusion and presentation of the data (Creswell, 2007; Miles & Huberman, 1994). In a similar but more detailed way, Yin (2011) outlined qualitative data analysis in a five-phased cycle: organization of the data, fragmentation of the data by coding, reconstruction of themes and codes, the interpretation of the data and drawing conclusions from the data. With the consideration of different approaches to qualitative data analysis, a 6-step process which provided a clearer and more detailed roadmap for the analysis was followed while analyzing the data in this study: (1) getting familiar with the data by preparing and organizing data for the initial analysis, (2) exploring data and generating initial codes, (3) establishing themes and descriptions by using codes, (4) reviewing and reassembling themes, (5) defining and refining the themes and (6) interpretation and validation of the findings (Braun & Clarke, 2006; Creswell, 2012). The analysis was conducted to identify the natural patterns available to observe within the data set. Analysis was conducted on each of the cases separately and it involved: coding data; generating themes; and drawing conclusions.

3.8.1. A Multi-Case Qualitative Data Analysis Procedure

In this study, data analysis of multiple case studies required an inductive approach. This approach began by constructing individual cases without 'pigeonholing' or categorizing them (Patton, 2002). Each case was then analyzed independently, following the occurrence of the cross-case analysis to identify patterns and themes that were common to the cases. The initial objective was to develop an in-depth understanding of the individual cases before they were combined for further analysis. This assisted the researcher to interpret emergent patterns and categories to ensure that they were grounded to specific cases and their contexts (Patton, 2002). Therefore, the comparison and contrast of categories, themes and codes that emerged from the data analysis were made after each case was analyzed and presented separately.

In first step of the thematic data analysis, for getting familiar with the data, all audio-records were listened to, observation and field notes were read and associated with interviews. Moreover, all documents that were collected were evidently read, arranged and systematized. Then, “Listen N Write”, a free software particularly produced for transcription, was used to transcribe audio recordings in this study. Following the verbatim transcription of the each interview data, the transcription was reviewed by listening to the audio-record one more time to ensure the accuracy of transcriptions. All written data sources were continuously read and the notes were taken related to initial ideas in order to extract themes and reveal the patterns in an ongoing cycle. In this step, getting familiar with the data and data collection continued simultaneously. Thus, evaluation of data for having a comprehensive understanding of the content and creating a foundation for the initial analysis were the constant efforts made as well.

After getting familiar with the data, the initial generation of codes was the second step of the data analysis. In order to provide inter-coder reliability (Miles & Huberman, 1994), a researcher from the department of Computer Education and Information Technology coded the same data independently (4 selected interview documents) in this step. This initial coding ensured clear definitions of codes with a good reliability check (Miles & Huberman, 1994). For the discussion sessions of codes with the other researcher, the built-in features of Microsoft Office Word such as comments and track changes were utilized.

For establishing themes and descriptions by using initial codes as the third step of the analysis, Nvivo12, a qualitative data analysis computer software, was utilized to handle and manage the large data sets. While the software still required the researcher to do the analysis, it assisted the researcher by providing distinguishing functions such as; storing different data sources, simple data coding, categorizing, retrieval and linking and comparing the codes (Creswell, 2012; Patton, 2002). Nvivo12 was particularly helpful to do comparisons by providing text data matrixes. The software was used only for analyzing interview data, observation and field notes. Relevant documents were analyzed by using pen and paper.

All related interviews for each case of the study were coded in this step of the analysis. In third step, the focus was on themes rather than codes. The initial codes were combined or split based on inclusionary themes in order to address research questions effectively (Braun & Clarke, 2006). For this reason, while some codes become more inclusive to create new themes or sub-themes, some codes were omitted. The themes within the data were determined in an exploratory manner with the help of an inductive approach (Patton, 2002). With this analysis approach, a data driven thematic analysis was actualized by ensuring that the data was coded without analytical bias or pre-existing frameworks (Braun & Clarke, 2006). Nevertheless, this did not mean that epistemological basis and conceptual framework of the study were not considered during the process of the thematic coding.

In the forth step, the candidate themes that were formed in the previous step were reviewed and reassembled in order to present the themes with distinct and attributable differences by keeping it as a coherent whole under each distinct theme. Therefore, the relationship between the scope of themes and the codes under them were checked at first, then the relationship between the themes and all the data were examined by 2 researchers (Braun & Clarke, 2006). This led to the formation of some sub-themes and the destruction of some others. This supported the appropriateness of the data analysis performed. Moreover, all changes were made with the help and contribution of the other researcher. Because, input from the researcher for the revisions of the themes was continuously taken during the process of thematic analysis.

In the fifth step, the themes and sub-themes were refined and defined peremptorily. Processing of the analysis in this step was required to form constant themes and provide their clear and concise definitions in order to expose the essence of the themes (Braun & Clarke, 2006). Because the themes and sub-themes needed to create a solid story of the dataset, overlapping of the themes to a great extent, thematic consistency and meanings of each themes were tried to be ensured and improved constantly. As a result, each theme was edited so that a general idea about the theme can be given at first glance.

The last step of the analysis was generating a comprehensive report about the data by interpreting the findings, demonstrating the value and validity of the findings and its conclusions. The step involved the transformation of the analysis into an interpretable text that would not only define themes and subthemes, but provide a sharp and fascinating quotations and examples related to themes, research questions and literature. The complex story of the data was tried to be described in the form of an analytic narrative that was as simple, concise and logical as possible in the results chapter of this study.

3.9. Trustworthiness

The strategies in qualitative research that are used for validating the accuracy and credibility of the researcher's interpretations and the findings, are different than those that are used in quantitative research. While the positivist criteria in quantitative research include internal and external validity, reliability, and objectivity for the evaluation of the scientific worth of the research, a different sets of criteria which are credibility, transferability, dependability, and confirmability are considered in qualitative research (Denzin & Lincoln, 1994; Lincoln & Guba, 1985). The strategies in this study that were used for ensuring the trustworthiness of qualitative findings were defined and justified in terms of these four criteria. Table 3.29 presents the summary of trustworthiness and practices of the strategies used.

3.9.1. Credibility

The term "credibility" (or authenticity or internal validity) refers to a criterion in qualitative research that shows "truth value" of the research findings (Lincoln & Guba, 1985; Miles, Huberman & Saldaña, 2014). In other words, credibility is an effort for validation aiming to judge the accuracy of the findings that are very well explained by the researcher and the participants (Creswell, 2007). To enhance the credibility of the findings, the following strategies were utilized in this study: triangulation, member check, prolonged engagement, peer review (Lincoln & Guba, 1985; Creswell, 2007; Merriam, 2009).

Triangulation: In triangulation, the data are collected from multiple and different sources to verify the findings (Creswell, 2007; Yin, 2009). Thus, triangulation allows the researcher to corroborate the evidences derived from different individuals, data types, or data collection methods applied for the same findings, descriptions and themes (Miles et al., 2014). Moreover, this helps the researcher to generate a more comprehensive and a deeper understanding and to realize the investigated phenomenon from different perspectives (Lincoln & Guba, 1985; Bogdan & Biklen, 2007).

In this study, the researcher obtained a clear and comprehensive understanding of ICT integration into education in different countries and developed different perspectives to the topic throughout triangulation process. In order to increase the credibility of the research and to strengthen the reliability of the existing evidence, the data collected from different individuals, such as teachers, administrators and ICT advisors. Additionally, different types of data sources (interviews, direct observation and field notes, documents) were used to enhance the validity of the study.

Member check: This strategy is considered the most important one in terms of enhancing the credibility of the study findings (Lincoln & Guba, 1985). In member check, the researcher takes the final report or themes along with the descriptions back to the participants in order to ensure the accuracy of the findings derived from the participants in terms of their own point of view (Lincoln & Guba, 1985; Miles & Huberman, 1994). Moreover, either raw data or transcriptions can be sent back to the participants in order to get their feedback as a way of implementation of this strategy.

In order to conduct member check within this study, 3 to 4 transcriptions of the interviews made in each country were consecutively sent back to the participants via e-mail (see Appendix E). They were asked to make comments and to use the "Track Changes" feature of Microsoft Office Word for the corrections. In this way, the changes and the corrections made were easily tracked. This stepwise process continued until the participants did not feel the need to make any further corrections and finally agreed on the accuracy of the transcriptions.

Prolonged engagement: Prolonged engagement and ongoing observations in the field allow the researcher to learn about the local culture of the studied area, to detect the misunderstandings that may possibly arise regarding the information produced by the researchers or the participants and to establish close relationships with the participants (Creswell, 2007). Making long-term observations helps researcher to capture the interesting points about the research questions and to make decisions related to the focal points of the study. This allows the researcher to obtain more accurate findings.

For this validation strategy, the researcher spent about 4 months in each country and about 1 week at all visited schools. Moreover, each participant was observed at least for once within the classroom environment. During the school visits, the researcher spent her time in the teachers' room in-between direct observations and she familiarized herself with the field and the participants (Creswell & Poth, 2017). This also enabled building a closer relationship with the participants prior to beginning data collection.

Peer review: Peer reviews are used as a strategy of validation in qualitative research. Individuals who are familiar with the studied area and the phenomenon are employed as an external controller of the data and the research processes that are utilized (Creswell & Poth, 2017). In that vein, a peer review is similar to the use of interrater reliability in quantitative research (Lincoln & Guba, 1985).

The advisors and the members of the doctoral committee were considered as peer reviewers of this study. At regular intervals throughout the study, the researcher had to present and justify the study findings derived through collected data and the employed research methodologies to the committee. The purpose of this rigorous process was to ensure the researchers' findings and research methodologies remained valid and unbiased.

3.9.2. Transferability

Transferability (or External Validity or Fittingness) refers to the applicability of the study results to similar contexts or situations. In qualitative studies, the researcher does not need to prove that the results are applicable, yet those who will transfer the results should justify them (Lincoln & Guba, 1985). Providing a detailed description of the phenomenon that is being researched including the methodology and the context is a strategy employed in order to allow the reader to make their own judgement regarding transferability (Lincoln & Guba, 1985; Creswell, 2007).

A rich and thick description: The detailed description of the steps to the research process, methodology, participants and context help readers to clearly understand the conditions and consequences regarding the research and the meaning of the research findings. Such rich and thick description allows the reader to have an idea of whether the findings can be applied to situations with similar conditions and characteristics (Lincoln & Guba, 1985; Miles & Huberman, 1994).

In this study, the researcher provided detailed information as much as possible regarding the context of the countries, participants, visited schools, process of the research including data collection and methodology with its justifications. Clear links to the social and cultural contexts that were effective on data collected were also provided. The purpose was to ensure that the readers got the opportunity to understand and assess the findings of the study in their own surroundings. It was also an effort to maintain the transferability of the study results to other studies with similar characteristics by providing experiences of the researcher that were gained throughout the research process. As more detailed descriptions were given, it was made easier for the readers to imagine the context in which the research was conducted.

3.9.3. Dependability

Dependability (or Reliability or Auditability) refers to the consistency of a research process used over a fixed period of time. Establishment of the dependability is possible by examining and analyzing the research process to ensure that consistent and repetitive findings are produced (Lincoln & Guba, 1985; Miles & Huberman, 1994; Creswell, 2007). Using intercoder agreement is the most common way to establish the dependability. However, good quality of voice recordings and error-free transcription of them can help the researcher to improve dependability as well. A meticulous analysis and coding of data by the use of computer programs as well as providing codes with clear definitions throughout the coding process also strengthen the dependability of the findings.

In this study, an audit trail and an intercoder agreement were utilized to establish the dependability of the study. Additionally, the researcher made sure that a high quality equipment was used for recording the interviews, then the mistakes made in the transcripts were eliminated by comparing them with the recordings over and over again. During the data analysis procedure, Nvivo12 was used to code and a coding table was formed to avoid ambiguous and conflicted code definitions.

An audit trail: Audit trails enable the readers to follow the methodology followed and the logic employed by a researcher, to discern how the researcher's thoughts about research steps evolved throughout the research processes and to examine key points of research procedures in order to boost trustworthiness of a research. Additionally, provision of this documentation strategy employed along with the interview transcripts, detailed field and observation notes, visual recourses, description of the context in which the research was conducted and detailed and in-depth information about milestones, significant decisions and timetable of the research process really improve the clearness and the concreteness of the research (Lincoln & Guba, 1985).

All the research procedures and a log of the research activities were documented similarly in each country throughout the study. The process of data collection and analysis were noted in detail by providing time information. Additionally, notes of iterative data analysis phase helping data reduction, code construction, elimination and re-creation were taken (Lincoln & Guba, 1985). While coding the interview transcriptions, memos were developed at Nvivo12. In the notes, methodological and analytic decisions were particularly pointed out.

Intercoder agreement: Intercoder agreement as another strategy for enhancing the reliability of the collected data is a process that transcript data are analyzed by multiple coders for determining whether the same codes are produced from the same excerpts of the document (Creswell, 2007). The code definitions that are generated by independent coders should also be consistent with each other (Marshall & Rossman, 2011). This is an attempt to diminish the bias and mistakes of individuals when analyzing text-based data in order to provide definitional clarity of codes.

In this study, the following formula suggested by Miles and Huberman (1994) was utilized to determine the intercoder agreement:

Intercoder agreement = Number of agreements / Total number of agreed and disagreed codes.

Miles and Huberman (1994) pointed out that for the first calculation of intercoder agreement, this result may be less than .70 in general. However, they eventually recommended a reliability score between .80 and .90 for a good reliability check after reconciliation meetings. According to Miles and Huberman (1994), after coding the designated data section consisting of 5 to 10 pages, the coders should discuss about codes and reach a consensus on the certain definitions of the codes. This procedure should be repeated until required intercoder agreement score is obtained. On the other hand, Hodson (1999) suggested that minimum 10 percent of the whole documents should be coded in terms of intercoder agreement.

In this study, the most informative interview transcripts with the most pages among each country's set of interviews were chosen, thereby more than 10 percent of the transcripts were covered by coding a total of 4 selected interview documents. These 4 interview documents included at least one interview from each country. A total of 67 double-spaced printed pages of the interview transcripts were coded by the researcher and an independent intercoder who was knowledgeable about the subject as well as experienced in qualitative coding. The independent intercoder was a researcher in the Department of Computer Education and Instructional Technology at Middle East Technical University. He published several journal articles and had proceeding papers including qualitative study findings and procedures. Additionally, his doctoral thesis involved qualitative data analysis and open-ended coding.

Before the coding process started, the intercoder was briefly informed about the purpose, the research questions and the methodology of the study. The researcher as the main coder and the intercoder also agreed about the procedure of the coding in order to ensure the reliability. This procedure included coding independently, assuring reconciliation of different codes, agreeing on all codes and re-coding if it was necessary. An 17 pages full-length interview transcript were separately coded by the researcher and the intercoder by using comments and "Track Changes" feature of Microsoft Office Word in a period of approximately 1 week. After first cycle of the coding, the two coders came together to discuss and comment on the similarities and differences between the codes in order to form a consensus and create a common coding table. Since the score of intercoder agreement was also under .70 (.64), the necessity of re-coding was occurred. After second cycle of the coding, the score was .87.

The sufficient score obtained from this second round allowed the researcher to continue coding by herself. However, during the coding process, any changes intended to be made over the codes, or when the codes were incompatible with the interviews, the intercoder was always consulted with. In these consultation sessions, both the interviews and codes were discussed, interpreted and tried to make a common decision about their meanings.

3.9.4. Confirmability

Confirmability (or Objectivity) refers to a degree of neutrality in interpreted findings. This means that findings should reflect what informants really say regardless of researcher bias. Objectivity might be possible if a researcher acknowledge his own prejudices and tendencies (Miles & Huberman, 1994). Thus, in qualitative studies, researcher's roles, biases, beliefs and dispositions should be clearly reported. Such a reflection of the researcher (reflexivity) is mentioned to show how the findings of the research can be affected by the researcher's preliminary judgments and biases rather than attempting to remove all the biases acquired by the researcher (Moon, Brewer, Januchowski-Hartley, Adams & Blackman, 2016).

Moreover, performing triangulation to reduce the influence of the researcher's bias, identifying the deficiencies within methods of the study and their potential effects, making a comprehensive methodological description to examine the completeness of the research results and using diagrams to show "audit trail" can help to provide confirmability (Shenton, 2004). In order to ensure trustworthiness of this study, strategies employed such as triangulation and audit trail were already explained and their form of implementation was provided under Credibility and Dependability headlines. For this reason, only the role of the researcher and her biases were mentioned below.

Researcher's Role and Bias: In the qualitative research, considering the researcher as the main instrument of data collection and analysis (Merriam, 1998, Patton, 2002) and the process of constructing meaning of data which happens in the researcher's mind creates a threat against objectivity (confirmability) (Bogdan & Biklen, 1998). Although providing an absolute objectivity might be impossible, objectivity in the research requires the researcher to acknowledge his/her own intentions (Miles & Huberman, 1994) and to be honest about his/her prejudices, biases, values, feelings and point of view. The biases of the researcher and the findings should be described clearly enough to show that the subject was really researched instead of employing biases or beliefs of the researcher while establishing the research findings. In this way, it will also be possible to clear the concerns regarding the researcher's biases and allow the reader to decide whether or not these biases were effective on the interpretation of the data collected (Sampson, 2012).

In this study, the researcher paid extra attention on the data collection process by keeping a journal and reflecting the notes on interviews, participants, her attitude and thoughts to avoid misinterpretations of the data. With the help of notes kept within the journal and triangulation method applied, the researcher tried to ensure that the interpretations and findings derived from the actual data collected from informants rather than produced through the effect of the researcher's imagination or biases. Moreover, bias, values and ideas possessed by the researcher along with her background and the role within the study setting were presented.

In terms of *the role of researcher* in the study, the interview protocols were developed considering the related literature and they were administered/conducted by the researcher. Observations in the classrooms and schools were made by the researcher under the role of "the observer as a participant" (Gold, 1958). The researcher sometimes interacted with the students, teachers or other stakeholders, but never fully participated in the activities held within the classroom, her status was known as the researcher in general or the foreigner researcher while working in different countries. During the observations, field notes were written down and photos were taken by the researcher for being able to illustrate the social setting and to support the data coming from interviews. Furthermore the researcher, as the main instrument of the study, analyzed, interpreted and discussed all qualitative data sources by limiting her biases.

The researcher investigated the required financial resources to continue with the research study more effectively. She applied for country scholarships and TUBITAK scholarship in particular. She was awarded with a scholarship by CIMO for doing her research in Finland for 4 months. TUBITAK supported her in S. Korea for 4 months. In Turkey, She was already working as a research assistant and she did not encounter financial problems.

Considering *the background of the researcher*, she was graduated from the Faculty of Educational Science as a computer teacher in Turkey. She had 1 year teaching experience at a middle school. After that, she started her integrated Ph.D. in the field of instructional design at METU. During the data collection period of the research, she was a Ph.D. candidate at the Department of Computer Education and Instructional Technology at METU and she was working as a research assistant at the same department. Her interests consisted of educational technologies, technology integration, human-computer interaction, usability testing, performance technologies, and educational games in special education.

Since the beginning of her Ph.D., she involved the projects which utilized qualitative methods and analysis strategies. Moreover, she took part in related conferences and proceeding papers produced by qualitative research methods. She also took courses related to qualitative and quantitative research methods. These courses were sufficient in terms of learning the purposes of different paradigms and research methods and their possible implementations. In accordance with the purpose of the research, the researcher was aware of the need to conduct a qualitative case study to do an in-depth investigation in a certain context and see the whole picture.

The researcher took part in international joint projects, European Union projects, comparative studies and private research projects for companies either as a researcher or a student. This improved her English language and conversation skills. Moreover, her analytical ability, adaptability, collaboration, communication and problem solving skills were strongly advanced by working in such projects.

Trustworthiness criteria and the strategies used in this research are summarized in the following table.

Table 3.29. *Summary of Trustworthiness*

Trustworthiness	Strategies	Implementations
Credibility	Triangulation	• The data collected from different individuals. • Different types of data sources were used.
	Member check	• 3 to 4 transcriptions from each country's interviews were consecutively sent back to the participants via e-mail.
	Prolonged engagement	• 4 months time period was spent in each country. • At least 1 week was spent at all visited schools. • Each participant was observed at least once in the classroom environment. • The researcher spent her time in the teachers' room in-between direct observations. • The researcher built a close relationship with participants.

Trustworthiness	Strategies	Implementations
	Peer review	• At regular intervals throughout the study, the researcher presented and justified the study findings derived through collected data and employed research methodologies to the advisors and the members of the doctoral committee as peer reviewers.
Transferability	A rich and thick description	• Detailed information about the context of the countries, the participants and visited schools, the process of research including data collection and methodology with its justifications were provided. • Clear links to the social and cultural contexts that were effective on data collected were also provided.
Dependability	An audit trail	• The research procedures and a log of research activities were documented. • The process of data collection and analysis were noted in detail by providing time information. • Notes of iterative data analysis phase that helped data reduction, code construction, elimination and re-creation were taken. • While coding the interview transcriptions, memos were developed at Nvivo12.
	Intercoder agreement	• The most informative interview transcripts with the most pages from each country's set of interviews were chosen (10 % of the transcripts). • The selected interview transcripts were coded by the researcher and an independent intercoder (.64 → .87).
	Multiple observers	• When other researchers were available during observations, they were asked to observe classrooms together.
Confirmability	Defining researcher's bias	• Background of the researcher, researcher's assumptions, limitations, delimitations were provided. • The role of researcher in the study was defined.
	Triangulation	• Multiple data sources and multiple data types were used.
	An Audit trail	• Each phase of the study was documented in a detailed and descriptive manner.

3.10. Ethical Considerations

In research studies, what is done to protect the respondents from potential physical or emotional harm should be explained and any ethical problems that encountered while conducting the research should be discussed (Lincoln & Guba, 1985) in order to demonstrate the ethical standards of a study. Ethical issues of qualitative studies are more likely to arise in the process of data collection and dissemination of research findings (Merriam, 1998). For this reason, it was important to pay particular attention to the research steps in which some ethical dilemmas were likely to occur.

Ethical principals were taken into consideration sensitively and carefully throughout the research process. The necessary permission of the Ethics Committee at METU as well as permissions of institutions and participants were taken prior to employing the interviews and observations in each country at the beginning of the research process in order to guarantee the rights and the safety of informants. Moreover, each participant was informed fully about the purpose of the research and the research process and then interviews were conducted with participants on a voluntary basis without any enforcement. Before the interviews, informants were asked to give their consent about participation to the study. Participants also had the right to stop the interview whenever they felt like it.

To ensure confidentiality of the data and anonymity of the participants in this study, the data obtained from the interviews were not shared with any third party and names of the participants were not associated with the particular set of data anywhere. Additionally, participants' identities were kept confidential while analyzing the data by labeling the interview transcripts with fictitious names.

While writing the findings and conclusion of the study, the neutrality of the researcher maintained by depending only on the data being derived from interviews, documents and observations. Moreover, while the themes and designs were being created, the researcher tried to be as objective as possible by being aware of her predispositions and assumptions. The findings were then compared and contrasted with the findings of other studies in the literature as well.

3.11. Delimitations and Limitations of the Study

3.11.1. Delimitations

This study has exclusionary and inclusionary delimitations as follows:

- First, it was delimited to actual use of ICT of teachers in the classroom context in Turkey, Finland and S. Korea.
- Another delimitation was that this study focused only on the use of ICT in practice, namely implementation phase.
- Third, it was delimited to teachers who takes active part in the implementation phase, principals, and ICT advisors who affects teachers' implementations.
- This study was delimited to data derived from semi-structured interviews, emails, unstructured observations and documents.

3.11.2. Limitations

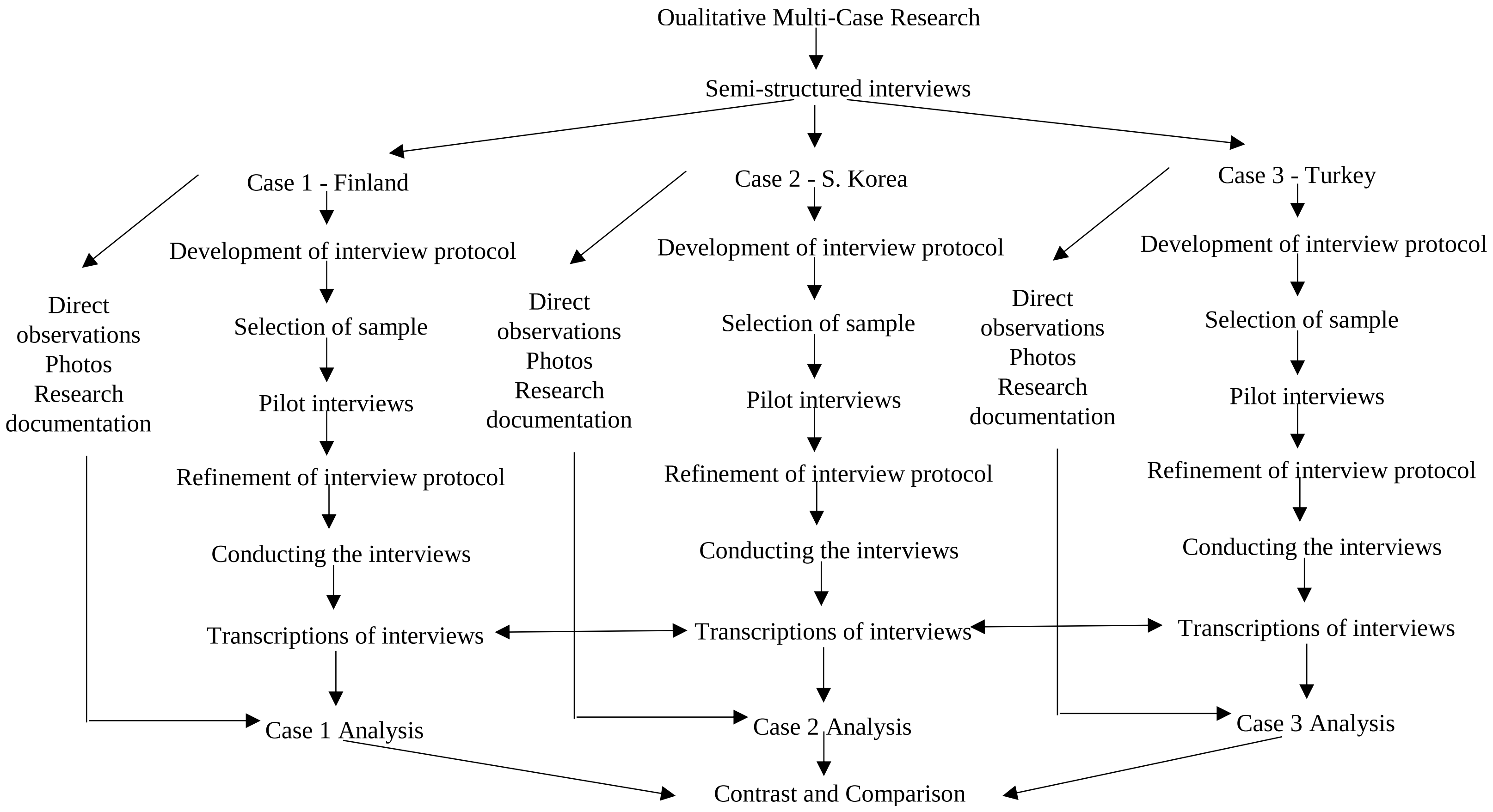
This study was subjected to certain limitations due to the nature of qualitative research methods and the context in which the research was conducted.

- The main limitation of this study was 4-month time period of research to be spent in each foreign country.
- Purposeful sampling technique was used to determine the participants that would take part in the study. Thus, the findings were conclusive just for this study.
- The findings of this study were limited by the honesty and knowledge of the participants and their nonbiased participation.
- The study's findings are limited to the researcher's interpretations. The data was collected, analyzed and interpreted by the researcher, as such it cannot be assured that the findings are completely independent of the researcher's opinions despite of various reliability and validity checks.
- Use of foreign languages in Finland and Korea was a challenge. The communication occurred in a non-native language considering both sides of the interview, namely the researcher and participants in these 2 countries. In S. Korea, 3 simultaneous translators from Korean language to English, 2 simultaneous translators from Korean language to Turkish helped in executing

the interviews. This translation process extended the duration of the interviews and perhaps it caused some misunderstandings during deep discussions naturally. In Turkey, the interviews conducted in native language. However, all findings were written in English due to Middle East Technical University requirements and policies. Since the languages were translated into each other for a couple times and some of the communications were established in non-native language, the data collection and analysis processes may had been affected by some semantic shifts.

- Data collected from S. Korean participants was limited to 6 interview transcriptions and 14 interviews that was answered via e-mail since S. Korean participants were not mostly willing to participate in a face-to-face interview mostly.
- Data collected from Turkish participants were limited to 19 interview transcriptions and 2 interviews that were answered via e-mail since these 2 participants claimed that they didn’t have time for a face-to-face interview.

3.12. Summary of the Research Methodology



CHAPTER 4

RESULTS

The purpose of this study was to investigate and analyze the differences and similarities amongst Turkish, Finnish and S. Korean education systems in terms of the aspects affecting ICT integration in classroom practices within the boundaries of a Multi-Level Ecological Perspective (Zhao & Frank, 2003). The study probed the aspects affecting ICT integration within a multi-dimensional framework incorporating regulations, institutional and contextual aspects. The study was guided by a comparative case study approach. The teachers' and principals' perceptions of integrating ICT into the teaching and learning process were disclosed with the help of interviews and observations. Additional data to support the interviews and direct observations were provided by the examination of the related documents. Finally, in order to draw a conclusion, the themes and sub-themes emerged from qualitative data analysis that were key to the research questions were categorized and brought together according to their interrelatedness.

This chapter mentions the aspects affecting ICT integration in classroom practices in three different contexts regarding the statements of the participants. The main outline of the story was set by an intertwined framework based on an ecological perspective. In line with the mentioned multi-level ecological perspective, emerging themes and sub-themes were organized and listed under macro, meso and micro levels in order to answer the research questions.

The findings were stated in the following structure: Firstly, each theme was summarized individually and then each context regarding Finland, S. Korea and Turkey, respectively, was explained with the help of the quoted statements of the participants under each theme and sub-theme. In addition, at the beginning of each level and theme, a compare and contrast paragraph was provided in order to demonstrate a holistic view of the contexts. Thus, differences and similarities between contexts were intended to be revealed more clearly. Additionally, at the end of each level of issues, a table showing similarities and differences was also presented. Lastly, a figure showing the relationships between the themes and sub-themes that the findings indicated was drawn.

The total number of participants were 60 in this study: The number of Finnish participants were 19 and the number of S. Korean participants were 20, while the number of Turkish participants were 21. Under each individual theme, the number of participants from each country was provided to illustrate how many people contributed to form each themes or sub-themes. A summary table containing these information was given at the beginning of each level of issues and then the statements of the participants in Finland, S. Korea and Turkey, respectively, were written as findings.

The findings regarding ICT integration in classroom are presented in the framework of multi-level perspective. Therefore, there are 3 main levels: Macro, meso, and micro. Macro level includes such themes and codes regarding national, institutional, and governmental standards, and societal and technological trends that individuals could not directly intervene. The meso level issues are more specific than the macro level issues and includes themes and codes at the organization level. The issues reported in the meso level are related to the school, its structure and culture. Micro level includes issues at the level of the individuals in the organizations. Micro level is also presented by the codes and themes about the classroom and learning environment.

The findings are reported with deductive reasoning. For this reason, the narration of this deductive report moved from the general aspects to the specific aspects of technology integration into education. In this sense, it was primarily aimed at drawing/showing the big picture and later looking at classroom issues closely.

4.1. Macro Level Issues

The macro level issues consist of wider and higher-level processes and structures that are predominating to the ones in meso and micro levels such as policy structures and belief systems (Chai, Koh, Lim, & Tsai, 2014). In this study, macro level issues included aspects focusing on curriculum, policy makers, policy satisfaction and system planning and management. Table 4.1 below presents the issues and sources regarding the macro level. Issues refer to the themes and the sub-themes, while the sources refer to the number of participants who were the data source of the specified themes and/or sub-themes. F (Finland), K (S. Korea) and T (Turkey) refer to the number of participants from the corresponding country that contributed to the formation of the themes. As can be seen in Table 4.1, some themes / sub-themes may have been emerged by the contributions of participants from only a single country or two countries.

Table 4.1. *Macro level issues*

Macro Level Issues	Sources	F	K	T
• Guiding Principles				
○ Policy Satisfaction	41	9	16	16
○ Policy Makers (only K&T)	9	-	1	8
○ Curriculum	29	8	8	13
▪ New curriculum (only F)	12	12	-	-
▪ School curriculum (only F)	11	11	-	-
○ Administrative Supervision	22	8	5	9
• Determinants for ICT use	31	14	7	10
○ Inequality of Opportunity in Education (only F&T)	15	11	-	4
○ Financial Limitations	27	16	5	6
○ IT infrastructure & Logistics				
▪ State of the Infrastructure	36	11	8	17
▪ Technical Problems	19	11	2	6
▪ Maintenance & Support	53	17	17	19

Macro level issues included guiding principles, and determinants for ICT use as main themes. Guiding principals included policy satisfaction, policy makers, curriculum, and administrative supervision as sub-themes. Policy satisfaction was most commented theme on (n=41) that was issued under macro level. The comments of participants were mainly about their satisfaction level and complaints related to the current policies in practice regarding the ICT integration in education. Policy Makers was the least commented theme on (n=9), and only emerged from the data collected from S. Korean and Turkish participants. The participants from these two countries experiencing a top-down management system had the belief that if policy makers attached importance to the technology integration, the importance given to this process would increase in schools.

Curriculum as a theme covered the role of curriculum policies on ICT integration in education. Almost half of all participants (n=29) mentioned that there was a role of the curriculum that would promote the technology integration. Two sub-themes of curriculum (new curriculum and school curriculum) emerged to be specific to only Finland. That was because when the interviews conducted, a new curriculum was about to put into practice, and unlike other countries, Finland schools had a school level curricula. Thus, the role of new curriculum and school curriculum were discussed by Finnish participants. Additionally, administrative supervision explained how curriculum policies, testing policies and evaluation policies could change teachers' ICT use in the classroom. For instance, in Finland, since there was a possibility of taking an online university exam in the future for the students, teachers tried to make students get prepared for the exam by providing relevant opportunities and support for practicing. On the other hand, since Turkey and S. Korea had a written type of university entrance exam instead of online examination, they were focused on more 'traditional' practices. Interestingly, some Turkish and S. Korean participants didn't feel the need to use technology in the classrooms due to lack of enforcing standards and "teacher assessment" systems that would have made the ICT use in classrooms obligated. In other words, there wasn't any strong supervision on their choices, as a result teachers mostly preferred not to use ICT in some cases.

Lastly, under the name of determinants for ICT use as a theme, three sub-themes emerged; Inequality of opportunity in education, financial limitations, and IT infrastructure & logistics. IT infrastructure and logistics were categorized into state of infrastructure, technical problems, and maintenance and support.

4.1.1. Guiding Principles

Guiding principles referred to the components of the educational system at higher levels of it that constitute the management at institutional level. In this case, educational policies, policy makers and curriculum were as the components of educational system that defined and shaped teachers ICT use. These components could not be changed directly by the teachers, but the teachers were the ones that interpreted and implemented them. In this context, under "guiding principles" theme, the participants explained their understanding of these components and their positive or negative impact on their ICT use in the classroom. Policy satisfaction, policy makers, curriculum and administrative supervision were the sub-themes emerged.

4.1.1.1. Policy Satisfaction

Policy satisfaction included discourses about how satisfied participants were with the current policies related to ICT integration in education. While 41 of all participants addressed this issue, 9 of them were Finnish, 16 of them were S. Korean and 16 of them were Turkish.

The participants seemed satisfied with the current policies regarding the ICT integration in education in Finland, but they believed that they could still be improved. More importantly, they emphasized that the applicability of the policies was limited to the economic boundaries. The S. Korean participants proudly claimed that S. Korean people were good at both manufacturing and using technology. They also unhesitatingly stated that the policies supported the use of technology in education. However, they pointed out that there was a gap between written policies and their practices due to a limited budget, lack of sustainable operations and maintenance practices. The first and only thing that came to Turkish participants' mind was FATIH Project when made a mention of the policies regarding ICT use in education. Even if FATIH Project was exalted in terms of providing equality of opportunity and improvement in technology employed at schools, Turkish participants emphasized that the project was actually managed differently than it was supposed to be due to the lack of planning, an insufficient budget, the lack of technical support and the resistance of the teachers to proper application. Likewise, other policies are said to show differences between what was actually written and what was actually practiced, once again owing to the poorly planned application process and rapid changes in the policies.

Finland

In Finland, even though current policies were regarded as good enough by the participants (n=6), they weren't easy to implement since:

> *The goals set by the government are very high… they are all nice and optimistic and necessary also…but those policies aren't that concrete…and they are only some sentences written, but then how to apply or use them is the problem." (F2)*

> *In my opinion, it seems integrated but it is not so strongly mentioned in our current curriculum. (F1)*

They were also "…*very good only in theory*" (F2) and they were "…*great on paper, but reality is different.*" (F18) They need to be improved:

> *At the moment, it is good, I think. They keep up with the time and they know what they are doing… It is enough, but I think it could be better. (F9)*

> *I think that in general the policy of ICT use in education should be more effective and there should be some kind of an expanded vision about what we should do nowadays in the schools. (F12)*

Even though the current state of the technology integration was considered sufficient by the participants, they agreed that the integration is a continuous process and it is far from being complete. Financial issues prevented the desired improvements to be made. A physics teacher and a principal explained, respectively:

> *I think they are trying to incorporate the ICT into it more and more, but I think at the moment, the economy is so bad that they are not able to support what they want to do. (F18)*

> *I wrote something about Turkish project [FATIH] and S. Korean project [Smart Education] on our newspaper called "Helsinki Sanomat" a couple of years ago. I said that we should do something similar. Then, of course I sent my writing to our parliamentarians and our ministry of education too. They liked it very much but...the money. Not so much has happened yet, but I hope that it will happen in the future, we have such plans to do. (F12)*

S. Korea

Most of the S. Korean participants (n=11) agreed that the use of technology is supported by government policies. They pointed out that S. Korea is quite advanced in technology use. They are "aware that ICT use in classroom has been encouraged" (K18) by the government too. In addition, the participants (n=4) emphasized that while the hardware sufficiency is the primary focal point, nowadays more attention is paid to algorithm education. Several S. Korean participants commented on current ICT related policies as:

> *I believe that the government of S. Korea supports ICT use in education for the last decade, so that every single classroom has a desktop computer, a projector, a TV, a printer and etc. Also, the government pushes teachers to get training courses so that almost all the teachers can utilize ICT technics in their classes. And the government designed a project regarding software education and began to discuss it with various people in education sector (K13).*

> *I think the national policy supports ICT education since they provide schools with a big budget to purchase various devices. Also, they are collecting the opinions of specialists to facilitate and develop the national curriculum of S/W education (K14).*

While the S. Korean participants emphasized that the technology is used in education and the use of technology is strongly supported by the policies, they conversely claimed that the below mentioned hurdles and downsides exist when it comes to practice:

> *They definitely have some plans and ideas about ICT education but I think that we are running out of money. The problem is the budget…At the outside, the world is already living in the spring for using information and technology, but in the school, we are still in the winter in S. Korea (K2).*
>
> *The latest technologies and equipment are being used, however, the maintenance and the necessary upgrades doesn't follow (K19).*
>
> *The policy is too comprehensive and does not comply with the school's reality (K16).*
>
> *I think the policies are hovering around the profitable groups of people (K11).*
>
> *I cannot feel the policies directly. Because the curriculum changes once in every 5 years (K3).*

Apparently, The S. Korean Government has invested in ICT use in education, developed projects and provided in-service training for teachers. A S. Korean principal at elementary school (K5) pointed out that the investment in ICT use by the government had already brought S. Koreans' ability to use technology to a certain level. S. Koreans' interest for use of technology also contributed to the ICT integration irrespective of whether there were certain policies or not:

> *In S. Korea, the government has a lot of investments and grants in this regard. Teachers have the right to receive 60 hours of ICT training per year. We also have projects like "Smart Education" and we apply them. Now, a project called "Digital Education" is in development stage in S. Korea. They are always supported by the government (K5).*
>
> *In S. Korea, people's interest, tendency and ability to use technology have already reached up to a certain level. For this reason, it is not very important whether there is a policy or not in the country. People are*

already quite conscious about this and able to use many devices in this regard (K5).

Turkey

In Turkey, FATIH project was regarded as The Government's most explicit policy (n=9). The Fatih Project was thought to be beneficial in terms of increasing opportunities and ensuring equal standards for the students. A vice principal and a religion and ethics teacher working at a high school explained, respectively:

> *It is debatable whether there is a policy at a national level or not, but our schools have a training program supported by interactive boards under the Fatih Project. And that is used for educational purposes of course. The content is getting richer every day. There is a set of educational videos today, despite that there was nothing in the beginning. We can say that we have obtained a substantial amount of content regarding both mathematics and non-math courses. (T3).*

> *I think positively. In my opinion, the presence of smart boards in schools increases the quality of education. And we don't just consider the schools in city centers. Because, starting from counties to villages, many students are destitute of this technology. Therefore, this project has provided them with an equal opportunity (T7).*

Although the Fatih Project was regarded as a positive step towards dissemination of technology use, the participants (n=5) also emphasized the negative aspects of the implementation of the project. They criticized the issues caused by lack of planning and non-educational use of tablets. An information technology teacher stated that:

> *There are many shortcomings of the Fatih Project. The tablets were meant to be installed in an interactive manner with the smartboards, but despite the fact that 4 years have passed, the tablets have not yet become interactive with the board. Because the students can not use the tablets at their will, they break the passwords that are defined by the MoE. [The tablets] are not utilized in the schools. Students are currently using tablets only to play games at home… It would be better if the tablets were given to students after the infrastructure was fully built and the devices were fully integrated… They use the EBA but that is not enough either. The Internet is a vast sea of information. Students need to make research to*

make use of it all. However, because the Ministry of Education limits the internet use, that is not allowed in schools (T9).

Other participants also commented on negative aspects of the Project. The project was seen as a not fully settled throughout the country. The project needed to be brought to a certain level that makes students and teachers more active rather than more passive. Whit in the project, although there were tablets distributed to students, they were not used appropriately for their very purpose. Additionally, even though Fatih project was considered as a very good attempt for technology integration into education, a coordinator indicated that he can not keep up with what he has to do.

A number of other complaints (n=5) made related to the current policies' being rapid and that there are sudden system changes and lack of collective decision-making process. Some of the participants (n=2) also talked about the resistance that teachers created against this situation. The sudden changes were criticized for being without research base.

The policies are changing very fast and they do not even consult with the ones that are supposed to actually give this education, I mean us. Any opinons of the teachers regarding these changes and innovations in informatics are not taken into consideration. Everything is top down, and we are applying them… The curriculum is constantly changing, our books are constantly changing. Even we can not keep up with these changes. We are experiencing absurdities with some of the topics. (T5).

… We have experienced a lot of system changes regarding education. These were very serious changes, including the curriculum and the practice of the courses. But for every change, teachers are the greatest source of resistance. You can change the system, but when you do not have the teachers to apply it, it has no effects (T4).

First, you need to educate the teachers. But in Turkey, the teachers are always last to know about the changes going on. The curriculum changes, but you would not know it. That is, teachers' opinion is never asked and teachers are kept out when new decisions are about to be made… (T12).

Some participants further noted that the government should have allocated a budget for the technological needs instead of making the schools wait for the dissemination of the Fatih Project. That was because there were still infrastructural and technological requirements to be satisfied primarily and urgently at schools. A science and technology teacher from an elementary school, where the FATIH Project was not active yet, justified that:

> *A separate budget should be allocated by MoE for this. With this budget, arrangements should be made so that there are no classrooms left without projectors and computers… Principals should also be aware of the fact that this budget will be used for technology… Sometimes we have to move to the class to another classroom having a projector… Everything should be settled so I can use it comfortably there. (T18).*

A chemistry teacher from a high school and a social science teacher from an elementary school elaborated the relationship between the needs, the budget and the project respectively:

> *In fact, when the FATIH project first showed up, we were very opposed to it. Because we had more important needs. When the tablets were distributed, we thought whether we really needed a top down technology] that much, when there was nothing else. It didn't seem so necessary (T10).*

> *I think that existing policies are inadequate…There is not enough revenue. While we are not allowed to receive a monthly fee or a donation, we are expected to purchase the necessary materials with the help of the local resources. Local resources refer to community. But then how will this work without donation? Even when making photocopies, there is a difficulty we face here, because there is very little revenue (T19).*

Lastly, three of the Turkish participants particularly emphasized that the theory and the practice are different in the process of policy implementation. They indicated that what is written on the paper is distinguishably different from the practice of it. In order to solve this issue, one of them suggested that a fast-working bureaucracy is needed. Teachers and administrators must be educated and schools need to be improved in Turkey.

4.1.1.2. Policy Makers (only K&T)

The theme Policy Makers explained the perceived impact of policy makers on the technology integration process. Although Finnish participants didn't particularly mention something about policy makers, only a S. Korean participant and 8 Turkish participants had expressed their opinions about policy makers in line with the interview questions asked. Based on observations and interviews, policy makers in S. Korea and Turkey had the complete power and authority over educational institutions while the Finnish Society were more included in the process of educational policy making through discussions and research. Differences in policy making and management styles of countries shaped their own way of ICT integration into education.

S. Korea

A S. Korean participant pointed out that the government's being aware of the importance of ICT in education takes an active role in the ICT integration into education. A middle school principal expressed the approach of the government towards ICT and the influence of their approach on ICT integration:

> *Software subject will be starting next year. So, this puts emphasis on the importance of the ICT education and computer education. The president of S. Korea and many important people in the government are thinking about the importance of IT education nowadays. Thus, maybe curriculum and vision will change. Something will be included to curriculum or national policies (K6).*

Turkish

Turkish participants (n=8) indicated that The Ministry of National Education plays a major role in supporting technology integration into education. The main idea of their comments related to the policy makers was that the importance given to the technology use in education should start at the governmental level, so that more attention to this issue would be drawn by schools and teachers. A primary school principal simply stated that:

> *The [awareness regarding the technology use] can be established primarily through the ministry's projects. The Ministry should really pay attention to that. For this, it should ask school principals for motivating the teachers to care about the issue. Some work should be done at the school level (T14).*

An English teacher from a high school made a more detailed comment:

> *…But since even our basic needs are unable to be satisfied sometimes, I see the government's point of view as the greatest barrier here.* There is the building, there is the school, we got the teachers and we pay them. So, come on send your children and just let them study here! That's how the government sees it! *The government has done nothing to improve that (K12).*

Due to a top-down hierarchical structure of Turkish education system, the schools, principals and teachers followed the order of The Ministry of National Education as an absolute force:

> *The school is trying to do what The Ministry of National Education says exactly and not to go against it. They also implement every innovation. Because the schools are notified regarding all kinds of official letters, changes and regulations imposed by The Ministry. The school interprets them and announce to everybody. Then they go into operation (T5).*

Moreover, since the authority was the sole and the absolute, the ability of the organizations to give quick response to the needs may be hindered. The statements of the participants numbered as T21 and T4, supported and proved this situation:

> *For example, when I was an IT teacher, I would like to offer EBA training, but I have to get an official letter of permission. My word or the principal's must have been enough to do it (T21).*

> *The education administrators (provincial, district directors of education, branch managers, and assistant managers) should be quick to respond to the demands of their school administrators. Shortcomings regarding hardware can be eliminated without the arrival of FATIH project. Because, the current technology is becoming outdated at a very high pace.*

If they respond quickly, then we will realize that they care about this issue (T4).

Additionally, a vice principal of a high school commented on the problems emerging because the Ministry was the sole authority: (1) the strong formation of authority created fear while making decisions:

Authorities do not accept [non-precedential recommendations]. Authority can be used in a reasonable and a sensible manner, but everyone is afraid that something negative may happen with the use of given authorization (T13).

The ineffectiveness of teachers on policy and curriculum decisions restricted what teacher can do in classrooms. But, instead of rules or restrictions, teachers were to be blamed. Another vice principal of a primary school further noted that teachers were not regarded as an active component of ICT use concept by the authority.

4.1.1.3. Curriculum

Under the sub-theme "Curriculum", how the aspects of curriculum determined the use of technology by the participants in the classroom is presented. Almost half of the participants (n=29) agreed that national curriculum policy had a key role to catalyze the integration of ICT use in teaching and learning process. This theme was emerged from the perspectives of 8 Finnish, 8 S. Korean and 13 Turkish, regarding the impact of the curriculum on ICT integration in education.

The Finnish participants (n=8) emphasized that the flexibility of the curriculum was not always an auxiliary and a facilitative element in the educational process. The lack of clear boundaries and guidelines in the current curriculum were affecting decisions-making process of Finnish teachers in terms of the technology use in the educational process. Unlike the situation in other countries, there were sub-themes related to the new curriculum and school curriculum that had emerged from the Finnish data.

In S. Korean curriculum there was flexibility in terms of tools and methods that can be used, however this situation was not welcomed. Some of the participants claimed that the lack of details in the curriculum prevented teachers from fully understanding the curriculum. In S. Korea, the teachers were given the freedom to choose from pedagogical perspectives and different tools just like in Finland. Nevertheless, the participants said that the freedom may sometimes lead to negative consequences in the integration of technology rather than positive impact on ICT use in the classrooms.

In Turkey, the curriculum was also designed in an undetailed and flexible manner. However, unlike the participants from Finland and S. Korea, Turkish participants said that the reason for not using technology commensurately was due to the intensive content included in the curriculum but only a few number of courses to teach this content in return.

Finland

Finish participants pointed out that there is a need for a gradual change in the curriculum policy in order to enable ICT integration. A music teacher explained:

> *Our curriculum is quite old, there is a new one coming next year. For example, in music teaching there was nothing related to the use of ICT in current curriculum. That is because back in 2004 there was no sign of it (F17).*

Finish participants (n=8) also complained about flexibility of the curriculum. They claim that they had difficulties in implementation of the curriculum due to a lack of clear guidelines and standards telling how to use ICT in their own subject while teaching it. A home economics teacher and a classroom teacher commented on these difficulties arising from the flexibility, respectively:

> *We have not been advised how to use iPads, instead, we decide what to do on our own. We don't have rules explaining how to use it but we have rules telling what children have to learn (F14).*

…Because it is integrated into all subjects, we grade the pupils according to their subject knowledge. For example, in mathematics of 6th grade there are certain things that students have to learn, but there is not such standard of know-how in ICT. So, it is more like they should be able to do this and that, but then how, when and with the help of who… (F2).

A principal of an elementary school also pointed out that it is unknown how to use ICT in a particular subject because the curriculum lacks criteria for determination of how to use. A Finnish language/ mathematics/ psychology teacher at a primary school further noted that:

Curriculum is ok. There are actually good basic things but the main problem is also teachers… We have a good curriculum but nobody says anything how to teach it to teachers…Nobody says anything to teachers about how to teach it (F6).

New Curriculum: The Finnish participants (n=12) shared their hopes, concerns and thoughts related to the new curriculum. They all agreed that new curriculum would provide more involvement of ICT use in the lessons. The inclusion of coding into the new curriculum and the increased emphasis on the implementation of ICT use in teaching and learning process were the main changes that the participants claimed that would cultivate ICT use in daily life and education system. Although the change is welcomed in a positive and enthusiastic manner, the participants did not hide their concerns about the implementation of the new curriculum:

The concern of new curriculum is the training as a general issue for all of us, not only technical things but also pedagogical things (F6).

At present, we do not have that kind of teachers who could teach the coding to the pupils (F12).

I don't know how they will do it. Of course, for the older teachers the coding is much harder if you teach C++. I don't think that every teacher can do that (F15).

School curriculum: Finnish schools had their own school curriculum in accordance with the national curriculum. The city board could make decisions about the curriculum of schools in the city. Tangible or inexplicable points in the national curriculum were being attempted to be rendered more concrete and practical in school curriculum for each grade. Whether to offer ICT related courses to the students was decided by principal and teachers and added to school curriculum accordingly. A history and religion teacher as the principal explained that:

> *We have our own curriculum, and in there, how we can use the ICT is written and in every school in Finland, there is such a curriculum. I know that in our school ICT is not used more than in any other school… in curriculums, expressions on ICT use is similar (F9).*

S. Korea

Some S. Korean participants (n=3) mentioned that the national curriculum was flexible in terms of the tools and methods used. The content to be considered was the same in all schools, but there was no such statement advising any specific technology to use in the curriculum. That the details were not greatly considered in the curriculum and not understanding curriculum fully were seen as barriers to ICT integration into S. Korean education system. A computer science teacher and a principal pictured ICT education in S. Korea, respectively:

> *The national curriculum includes computer education in family studies so all the elementary school students are able to learn it from grade 5 (K13).*

> *Today, ICT in education in S. Korea can be fundamentally divided into two groups. First one is that the implementation of learning objectives by utilizing a computer can be done efficiently, because this would provide a variety of learning materials. The other is to have training on how to use the computer itself (K14).*

A S. Korean participant claimed that they don't particularly focus on ICT use since the emphasis on ICT use in education was not much anymore. A S. Korean middle school principal explained why ICT use in education guided by the curriculum is not a focal point anymore:

5 years ago, the education emphasized ICT a lot, because it was blooming. But these days, at home, families can manage ICT and stuff. So, we as school are not really interested in that part anymore (K1).

5 years ago, it was in the regulation book for the teachers, at least 10 %. But now, we feel okay without that 10%, so we can really do whatever we want. That percentage is meaningless to us. Because it all depends on the teachers (K1).

Turkey

Similarly, Turkish national curriculum provided outlines of lessons and contents without giving detailed information about how to use ICT in teaching and learning processes (n=7) just like the details weren't given in S. Korean and Finnish curriculums also. A high school math teacher explained:

[Where, when, and how to use the technology] is for us to decide. There is no guidance on how you may use it. There is the smart board, 20 hours of lesson granted and a curriculum. Do whatever you want to do with it. The more the teacher develops himself / herself, the more he will use the [technology] (T4).

Differently, some Turkish participants (n=6) complained about very intensive curriculum content and the inadequate number of teaching hours and these were counted as the reasons for not being able to use much technology in lessons. They did not have enough time to use technology, and managing time to teach whole curriculum within a given period and preparing students for exams were a challenge. A chemistry teacher clarified the situation:

I use the smart board, but if I have 4 hours of lesson a week, I would only use it for only an hour of it. Because we have a very busy curriculum (T10).

Three of Turkish participants claimed that teaching hours were not enough to include the technology in teaching during the classes. The time specified in the curriculum was limited for both information technology teachers and an English teacher, respectively:

> *It is a disadvantage that the IT courses are only for one teaching hour. Setting up their labs and giving them time to open their computers already take 20 minutes if I assume that the course will be given in the lab. The teacher hardly can explain/teach the lesson in the remaining 20 minutes (T21).*

> *Watching a movie is also very good activity, but I can not keep up with everything because of the inadequate hours of class. I think this is the biggest barrier (T6).*

Lastly, a vice principal in a S. Korean high school explained that in high school, the students' success was measured by exams, and the success was not considered as associated with the students' ability of technology use commonly. For this reason, she claimed that the students would not care about the use of technology while focusing on their preparation process for the university exam. Especially in Finland and Turkey, since how to use the technology in the lessons listed in the national curriculum was not explained in a detailed manner, this situation was seen as a reason preventing the ICT integration in classrooms by the participants. S. Korean participants didn't really comment on or complain about current curriculum.

4.1.1.4. Administrative Supervision

Administrative Supervision referred to what limits teacher's autonomy in the classroom. For example, policies, curriculum and restrictions that can not be changed by the teachers but need to be followed and implemented. According to the interviews, policies appeared to create pressure and lead teachers both to use and not to use technology. These policies included curriculum policies, testing policies and evaluation policies. In addition, changes in these politics have led teachers to change both their pedagogies and their perspectives on teaching and learning process.

Finland

In Finland, the participants (n=8) claimed that changing testing and curriculum policies have been changing the possibility of their technology use and their pedagogical approach. For instance, in year 2016; in high schools they had final test on computers and it was due National level policies (Digabi- and Abitti-projects). They felt under pressure to keep up pace with the rapid changes made. But they also thought it was necessary. They did not declare any critical or negative opinion. They also believed that the change would contribute to the ability to use technology of both teachers and students.

> *I don't think that there is a pressure on me coming from school, but from Policies, yes. It is not school's fault and it is not even a fault. It is good that we will change the curriculum. School is not putting pressure, but the change is so fast and dramatic and this puts you under pressure… (F1).*

> *If it is on the curriculum and you have to do it. I think that promotes the use of ICT…Yes [the curriculum should push] because otherwise there are always people who don't do it but then we need the equipment and with that the pupil have a positive attitude and use it more (F11).*

S. Korea

Some S. Korean participants (n=3) claimed that the S. Koreans had a more traditional teaching and learning culture and that it was difficult to change it. This is because it was difficult to change the teacher's mind-set. If there were some rules brought within the scope of a project or they were told to use technology in the curriculum, they would try to use technology. Some S. Korean participants explained the situation as follows:

> *No [government don't force them to teach with the help of technology]. But, some teachers think it is too obligated to use technology. For example, in our school, there are many teachers, who work here more than couple years, they cannot use technology well, but I have to use technology due to the school being future school since this year (K3).*

> *Because it is just a school. Outside of the school, a foreigner perspective could be summer, but in schools not. It is cultural thing of schools. It is really hard to change. There are many people who suspect the system when it comes to education. It is hard to change this kind of people's mind (K2).*

Moreover, especially in high school, because of its final exam policy, there was very little time devoted to technology use or teaching. Schools in S. Korea were in good shape in terms of infrastructure, but this did not mean that the teachers use them. A 6th grade classroom teacher explained:

> *In S. Korea, schools may be good at technology integration, but in many schools, that you went and observed, I am sure you realized and understood that this is not the case. I agree with that. This is because the education is based on rote memory for learning and exam-oriented in S. Korea. There is a difference between solving a mathematical question on paper and solving it on a computer. We remain committed to a little more traditional method, we are working for the exam…We use it only for show (K4).*

Additionally, 2 S. Korean participants further noted that due to not having teacher supervision and evaluation policies related to their technology use, they don't feel forced or feel the need of using technology.

Turkey

In Turkey, every policy, strategy and request from the Ministry of National Education was necessarily implemented in the schools. This situation also necessitated the implementation of policies related to technology use. For example, the use of e-school application is compulsory at schools. Teachers had to use the platform to share and report the end-of-semester grades of the students instead of handing them a printed version of their report card. Moreover, in the schools where the FATIH project was being implemented, teachers had to use smart boards in a way and students needed to use tablets. The Ministry of National Education was trying to make use of technology by teachers and students through policies. However, this didn't mean they would use the given technology as much as or as needed. 2 Turkish participants claimed that there was a need for pedagogical change during the integration of technologies into education.

Turkey, S. Korea and Finland share similar abstract and unclear definition of technology use in their curriculums. Since the Turkish participants (n=7) did not notice anything obvious related to how to use technology in the curriculum, they could choose the teaching method as they wished and it did not have to involve the use of this technology. In a similar way, teachers' and students' book did not also provide guidance in terms of how to use technology. Curriculums and books with more specific and guiding definitions would be more helpful for technology integration. In addition, another issue regarded as hindering the use of technology was the intensive content of many subjects at high school level. When teachers are trying to complete the teaching of the course content within a specific time period, they could not find the time to explain how to use the technology.

> *Many of our colleagues say that the textbooks are not very guiding, they do not guide them very well, and they do not get much from the textbook. In that sense they complain. Expressing them more clearly in textbooks or curricula can be effective and guiding (T2).*

In Finland, exams had a positive impact on technology use, while in S. Korea and Turkey, the case was the total opposite. Because, while the high school exams in Finland were computer-based, in Turkey and S. Korea, traditional type written exams were still in practice. Turkey's policies for testing had negative effects on advanced use of technology in the classes. For instance a Turkish participant explained that:

> *Smart boards are often used as a projector or for video display. Because teachers want to solve more questions, give more information. This is due to the test system. Teachers do not want to use technology too much because they think it is time consuming to use it in different ways. For example, my colleague says "I reflect my questions on the board, the more questions the better", the more questions he solves, the better for him (T1).*

It was said that there were deficiencies regarding evaluation policies in Turkey. Any feedback was not given to the teachers either by the inspectors or by the ministry about the use of technology in the classrooms. In addition, there was no obligation to use technology. Lack of feedback or lack of any regulation could cause teachers not to use the technology.

4.1.2. Determinants for ICT use

This theme emerged from what determines technology use of participants based on their discourses. This theme was different than the reasons of technology use in the classroom which was explored under the Micro Level Issues. It was different because the findings focused on macro level perspective and included broader concepts. This theme could be regarded as referring to the extrinsic factors stimulating technology use (Ertmer, 1999, Ertmer, Ottenbreit-Leftwich, & York, 2007, Ertmer & Ottenbreit-Leftwich, 2010). For example, most of the Finnish participants (n=14) pointed out that the policy and the curriculum requirements could strongly determine the use of technology. They indicated that these course of principles and studies should give a more detailed explanation and indicate a forceful purpose of use. Satisfaction with existing politics and how the technology related issues had been addressed in the curriculum and policies were presented in the "policy satisfaction" and "curriculum" sections. However, this section focused on why the teachers tend to use or not to use technology, by looking from a broader perspective.

Under this theme, the participants explained clearly what determined their use of technology from a macro perspective. These determinants could be considered as variables that could not directly be controlled by teachers. The participants referred to different standpoints and made it possible to create 4 sub-themes relatedly: Inequality of opportunity in education, financial limitations, administrative supervision, IT infrastructure and logistics (state of infrastructure, technical problems, and maintenance & support).

4.1.2.1. Inequality of Opportunity in Education (only F & T)

Inequality of opportunity in education was defined as the non uniform distribution of the main and supporting resources for the education such as funding and allocated budget, qualified teaching staff, written or digital sources, available technology and more.

Only the Finnish (n=11) and Turkish (n=4) participants clearly mentioned an inequality between schools regarding their resources and available opportunities. The situation in Finland was about the uneven allocation of the budget among the schools and for this reason some schools had better conditions. Turkish participants focused on the differences between the physical conditions of schools and they claimed that this led to differences in the use of technology between schools.

Finland

Schools affiliated with universities had a larger budget, and the infrastructure and technology they had were clearly better (n=6) in Finland. However, opportunities in local schools were more limited. On the other hand, in Turkey, the concern related to the disparity between schools were more about the adequacy of the physical structure of the school.

A Finnish classroom/ICT teacher was worried due to reginal differences in Finland. Therefore, she pointed out the requirement of more money for countryside towns to fix it. A principal of a comprehensive school explained that they are not at the same level as Normalikoulu (teacher training school), because it a training school and all the students have iPads in there, but they don't have in their school. Another classroom teacher at a primary school made comments on this issue:

> *Well, children are not in an equal position, because if you are in a small school in the countryside they might not have the computers and you can't teach. There is somebody who has been in a school where every child has an iPad. So, there is a big skill level difference between them (F11).*

An IT Engineer/ICT advisor, a classroom/ICT/handcraft teacher and a principal working in a training school further explained the reasons of having different resources at different schools. Teacher training schools were special schools since they were affiliated to universities and they had to educate pre-service teachers. They got money directly from the state, while the municipal schools depended on the community. So they depended on how well every community economic situation was. A coordinator of ICT Education and ICT pedagogy of the whole Joensuu City including 20 schools at any level brought a different perspective to the issue. She also expressed the huge differences between schools, but she pointed out that it is the leader not the budget itself that creates those differences among schools.

Turkey

Turkish participants (n=4) emphasized the inadequacy of physical conditions in schools. This was regarded as a barrier for technology integration. A coordinator at the General Directorate of Innovation and Education Technologies, supporting the ideas of another Turkish participant (T6), stated that in the eastern regions of Turkey, even if the technology is provided by the FATIH project, there may be problems watching videos due to the differences in internet speed.

> *I think the infrastructure that comes with the vision of Fatih Project is enough. Because provided internet, connection speed, hardware tools, smart board, printer, tablet are all enough. In theory, however, these are thought in this way, but in practice we can not achieve the same thing, there are issues. For example, in the west of Turkey, the internet speed is very good, but it does not have the same speed in the east. While the students in the West easily watch a video, in the East they can not even connect because speed is not so good. But they will be fixed over time (T21).*

Once again T21 and T6 indicated that there are schools that are still in need of high-priority basic needs to be met rather than the provision of technology. In this respect, while T21 suggested changing the order of priority of policies, T6 proposed the strengthening of the technology in university education.

4.1.2.2. Financial Limitations

Financial Limitations described what kind of financial constraints the participants faced and how they were affected in terms of technology integration. In the countries this study was conducted, nearly without exception, the participants mentioned financial problems and inadequate budget at least one time during the period of data collection. Financial limitations were perceived as a barrier for technology integration in all countries. The Finnish participants more focused on finding alternative solutions to existing financial problems instead of constantly complaining about it while making interviews and observations. For example, by producing projects, sharing devices within the same school and city, encouraging students to bring their own devices, the teachers and their community were trying to overcome financial limitations. In S. Korea, there was no problem about initial purchase of devices but the problem was the lack of such a budget for renewing and updating existing devices. Furthermore, both in Finland and S. Korea, no advanced level of technology use or excellent technology integration were observed in state schools, except for the specifically selected, equipped and financed schools. The situation was not very different in Turkey. There was a project (FATIH) supporting the technology integration at schools and the number of schools participating in this project was being gradually increased. But apart from the project, there was no allocated budget for technology purchase or upgrade at schools where the project was not implemented yet. Current school budgets were being spent to meet the primary and physical needs of schools in those schools. For this reason, technology integration was not considered a priority at the level of school management due to the lack of sufficient budget.

Finland

Although the participants in Finland (n=16) complained about that the budget for purchasing technology and paying for the substitute teachers was insufficient, they indicated that there could be an alternative solution to these problems. One participant (F4) stated that ‘I think management is not a problem or maybe second important thing after money. The money is an issue for supporting ICT in education'. And another (F5) commented as 'a more important question is where to find money for the schools and for the computers. Now in whole Finland the money is national level problem'. Similarly, 5 more Finnish participants highlighted the inadequacy of financial support.

5 Finnish participants pointed out that they tried to make the best out of available resources instead of complaining about shortage of money or limited resources. They indicated that they appreciated the current situation despite the difficulties, and found new ways to benefit from current resources in order to overcome the financial constraints:

> *I think; this is my personal opinion; instead of being always whining that we don't have money, we are now empowering people to do their best with the stuff that we already have. If we have 2 computers, it is ok, then we have only 2, but we have to do our best to keep those 2 computers running all the time and every minute is used by some students. That is what we should concentrate on (F5).*
>
> *I would buy tablets not for every student but for every classroom, it is better if I can buy 25 but I think that 10 is enough for now (F19).*

Technology procurement through projects (n=4), using shared technology provided by the city board (n=10), leasing the devices (n=6), the adoption of Bring Your Own Device (BYOD) concept (n=9), inviting the educator to the school instead of going to another city for the ICT course (F7) were the alternative solutions developed to overcome financial inadequacy in Finland. Among the alternative solutions, technology procurement through projects (n=4), sharing technology (n=9), leasing system (n=6) and the concept of bring your own device (n=9) were the most emphasized. Teachers were attending the projects to provide technology:

> *Teachers participate the future classroom project to get these iPads. They have made a promise that they won't buy any school books in 5 years. If you don't buy school books then you have enough money to lease these iPads for kids for 5 years (F13).*

The city board had a certain number of laptops and iPads. Those devices could be booked by the schools in Joensuu city through an online calendar application. Observations made in Finnish schools also confirmed that the computers and iPads provided by the city board were actively used in the classrooms. For instance, among the 20 schools in Joensuu in Finland, it was observed that the devices were used upon reservation through an online platform.

Even though borrowing technological devices was described as an alternative solution in the presence of financial problems, this solution had its own difficulties. For example, the number of devices for all schools in the city were still insufficient. Thus, the teachers were only able to access the devices when the date was available, not whenever they needed it. This, in return, led to uncertainties about its effective use in the classrooms. Additionally, borrowing technological devices from the city board or not having personal iPads would cause personal applications and materials to disappear since other users may change the settings of the tools.

> *If students have their own devices, it would be easier. Because one problem is that saving things on IPads. If you do something, where do you save it? Because they don't have their own device and IPads change classrooms in every classroom hour. If anybody wants to delete the work, it will be deleted. If they had their own devices, it would be much easier (F18).*

In Finland, technological equipment were often leased from a company. The leasing system (n=6) was preferred both in terms of being cheap and keeping the tools up-to-date. Moreover, the companies provide technical assistance for the teachers.

> *All computers are not owned by the school. We are renting some of those from companies owned by the city of Joensuu and communities near Joensuu. They are some kind of city owned company where there is the technical stuff, help desk, hardware, building and we are contacting our personal assistance there. So, they come here and fix it. If something is wrong with the computers, teacher contact Terro first then the help desk from the company (F7).*

The concept of bring your own device was a rising trend in Finland. The participants believed that this concept would bring an alternative solution to the problem of insufficient money, time and space at schools. Almost half of the Finnish participants (n=9) further noted that this concept would enable more learners to have access to technology in the classroom.

> *We have an IT class here but one IT class is for 17 students. So, it is not enough and you should have your own device if you want to use it daily or school should provide it (F7).*

For some, the iPads or phones that students brought could be the only option for access to technology. For example, one interviewee said that "*We can use student's own telephones. It is only what we have, but it helps*" (F19). Considering the importance given to the equality in education, the government would be able to provide for the students who can not bring their own device, but not for all.

> *Of course, the equality question comes to the use of students' own devices. We are trying to promote also the elementary school students to use their own mobile phones in learning at the schools… I think -even the 10 years old students- 95% of all students have their own smart phones. For this 5% that don't have, we have enough money to lend them school's devices. This is our school's strategy. You know; most of the students, they have nicer phones in their pockets than their parents or nicer phones than our school computers are. So, it would be stupid to use school's old computers instead of those new mobile phones (F5).*

In addition to the inadequacy of the budget allocated for purchasing technology, the lack of a separate budget for the substitute teachers (n=3) and expenses for the trips that would be organized for the educational purposes (n=2) were also regarded as a financial limitation in Finland. A principal pointed out that the fees paid for those assigned as ICT leaders in schools were very little due to the lack of financial resources. Observations had also revealed that the teachers volunteered to help ICT jobs in schools.

> *I will pay to Mariita and Olli (ICT leaders, advisors) only little bit due to lack of sources… we need money (F16).*

Another Finnish principal summed up by saying that '[using ICT depends] on principal and on teachers, and of course on economic resources' (F3).

S. Korea

Some S. Korean respondents (n=5) indicated that although the S. Korean Government did support technology purchases, there were no dedicated budget for any renewing and upgrading an existing technology. For this reason, whether some money would be spent on technology or not was decided according to the priorities of the schools. The inadequacy of allocated budget was indicated by 3 S. Korean participants. Rest of the participants who commented on this issue (n=2) explained inadequacy of money for renewing and upgrading an existing technology as:

> *The technological infrastructure of our school is actually quite good. We have two computer labs. But the problem with our school is that our computers can not be updated and can not be switched to smart computers. There's no Wi-Fi in our school right now. We can only use wired internet…This is due to financial problems. The government provides some financial aid, but it is hard to make changes with technology, such as switching to smart pads or smart tablets with that financial assistance (K5).*

> *At out school, we are trying to follow country policies to a certain extent. But we have financial difficulties. We assess what we can do most with the money we have (K4).*

Based on the observations, the technology was actively used only in some specifically selected schools and private schools in S. Korea. For instance, there were private schools equipped with advanced technology with the support of Samsung and Microsoft. These schools were visited and couple of teachers were interviewed in the schools, but no findings were given here, because the scope of this research was limited with the state schools only. However, these observations had helped to understand the differences between general and private schools in terms of opportunities offered and technology use. In addition, some state girls' schools or technology schools were selected by the government and pilot implementations were carried out in those schools. It had been observed that there was no high-level technology presence or use in any ordinary state school in S. Korea.

Turkey

In Turkey, 6 out of 21 participants also pointed out that the budget allocated to schools is limited. Therefore, on what purpose should the money be spent was assessed by the school administrators and expenditures were made accordingly. The remaining needs were tried to be met by the money coming from parent-teacher associations (PTA). A vice principal at an elementary school explained the situation in detail as follows:

> *Integration of technology depends on economic conditions. Schools do not have their own economic income. School is not a place of business. You have to follow the latest updates and renewals of technology in order to use them and provide trainings accordingly. But we cannot even provide equipment. We do not have the opportunity to obtain independent economic income at schools. So, the government should give them to you, you can only make a request for them. You cannot teach technology without having them… For example, if an internet connection is to be established, surely someone must come from outside the school. The money required for this is paid with PTA support. We have to use the existing resources appropriately, reasonably, logically, and well (T13).*

Other participants identified the problems caused by insufficient money. One participant stated that the number of computers in computer rooms did not increase in proportion with the number of students and this was a problem. Another problem was that the applications or programs to be used required payment. Procurement needs of school were managed to meet with the support and donations of the families. The school budgets allocated were not sufficient to buy additional equipment or to do any other extra purchase:

> *Parents buy a computer for the classes where their children are. They already have internet access from school (T11).*
>
> *There is not a lot of money the government gives. This money is barely enough to pay the electricity and gas bills. They give a very small amount of paper. Extra things are mostly done with donations (T19)*

4.1.2.3. IT infrastructure & Logistics

IT infrastructure and logistics referred to the management, and control of technologies that enabled and supported technology integration in schools. This aspect focused on the state of infrastructure, existing technical problems, maintenance and user support beyond the initial cost of the hardware and software. IT infrastructure and logistics were the keystones for the technology integration. Because they helped individuals build a solid foundation for using technology in the classroom environment and they also became determinant for the means and the amount of technology use. Although the infrastructure and logistics availability were the prerequisites for the use of technology, they were only an integral part of a whole. For example, the coordinator of ICT Education and ICT pedagogy of the whole Joensuu city regarded having a sufficient number of devices as one of the enablers for integrating ICT. However, this alone was not enough. She further noted that sufficient time, teachers' motivation, letting students use their devices in class and use them upon an agreed purpose were other enablers.

> *The enablers for integrating ICT are that there are enough devices for all, there is enough time to use ICT -because it is often there is extra time to use, that the teacher is motivated, the students have permission to use it. We have goal and everybody agrees on it (F5).*

A Turkish principal in a primary school stated that if hardware deficiencies are not eliminated at schools in a short time, some problems may arise in practice. Moreover, once technology related requirements were met, the transfer of knowledge, either by technology alone or through the teachers' help, was not enough for the integration of technology. The integration needed to go beyond the use of any particular technology. A vice principal from a Turkish high school explained that:

> *If the teacher can transfer the knowledge to the student by combining the hardware with his own knowledge, then the technology and the knowledge and skill of the teacher will be used more effectively. Only technology or only the teacher can go to a certain extent (T2).*

Since the infrastructure availability was an important part of the technology integration, topics such as the current state of infrastructure, technical problems, maintenance and support emerged as sub-themes from the analysis of interview and observations presented below.

4.1.2.3.1. State of Infrastructure

The majority of participants (n=36) from each country agreed that an infrastructure that is in working order and satisfactory would enable technology integration into education. To this respect, one of the problems making technology integration difficult in the schools was defined as the insufficient amount of equipment for both teachers and students. Finnish participants mostly had some sort of technological equipment, but they stated that the number of equipment were not adequate. On the other side, S. Korean participants claimed that they had adequate number of hardware and a satisfying infrastructure at the schools. Surprisingly, Turkish participants complained about not having a sufficient technological infrastructure and equipment despite the presence of FATIH project. In addition to that, there were problems related to internet connection, outdated equipment and maintenance service experienced.

Finland

In Finland, most of the participants (n=11) stated that each student and teacher should have acquired their own personal iPad. In this context, they complained about the inadequacy of the current number of equipment. For example, several of the participants explained their current state of infrastructure and problems that are related to infrastructure:

> *I think the problem is that the schools don't have enough equipment. With the new curriculum this is going to be a big problem, because they are talking about teaching coding there. If the children and the teachers don't have enough equipment, I don't know how they would code… I think, at the school level even if it is alright at the moment, I still wish that all the*

> *teachers had their own iPads because it could make things much easier (F11).*

One of the interviewees briefly outlined the problem and it was to the point:

> *Of course, you have to have some machine to use. It helps. If you have a school and you don't have any computers or tablets, it is a bit harder to enable you to use ICT (F15).*

The other two participants stated that they were not able to use the desired devices even when required or even if they independently wanted to, and it was due to of the insufficient number of equipment available. One of the participants further noted that besides the inadequacy of technology, largely due to the rapid changes and improvements in what is currently available, what they already have gets old and outdated very quickly. Another participant also mentioned the importance of having modern technology in support of this idea.

S. Korea

Unlike the Finnish participants, the participants in S. Korea did not complain about the inadequacy of the technology. Instead, they (n=8) mentioned that they had adequate hardware infrastructure at the schools. They also pointed out that both teachers and students could easly access technology at schools. However, the main problem about the infrastructure was pointed out as having old-dated hardware even though hardware had good quality. Additionally, some of the participants (n=2) complained about the lack of Wi-Fi.

> *In S. Korea, hardware is far more important and advanced than software. I think that work is being done by the government to provide proportionally. However, due to hardware enhancements, the government is currently providing training on new hardware ... It is possible for a student to use technology individually in public schools and at every school. It is possible for students to reach technology at every school… The technological infrastructure of our school is actually quite good. We have two computer labs. But the problem at our school is that our*

> *computers can not be updated, so we can not to switch to smart computers (K4).*

> *We need wireless LAN for smart learning that means use of new technologies and smart gadgets such as smart phone, tablet PC, etc… Wireless LAN should be built to support collaborative and communicative learning real time (K10).*

Turkey

Turkish participants (n=17) shared similar complaints about the infrastructure with Finnish participants. Technological infrastructure and equipment were not found sufficient. In addition to these, problems such as unstable internet, the lack of updated equipment, and the lack of maintenance were the infrastructure related issues in Turkey. Even if they wanted to utilize technology, they were not able to do it due to a lack of equipment. The other participant claimed that they had serious hardship due to inadequate infrastructure and equipment:

> *Unfortunately there is no infrastructure. For example, one of my colleague just asked me to print out the exam paper. But, since there is neither a working printer nor a working computer, the teacher couldn't meet this need. There are serious problems (T20)*

Several interviewees claimed that the infrastructure was inadequate in Turkish school despite the presence of FATIH project. They noted that due to the expectation of upcoming project, already existing technologies were either not upgraded or even removed. For example, some participants (n=3) were against shutting down or not renewing the existing computer labs, even if a new technology project was forecasted. Another highlight was that the technology available in the schools was too old and too slow. Internet infrastructure was also found problematic by 4 participants.

> *We have two laboratories, but the computers there are too old. The computers in the teachers' room sometimes work, sometimes not. The internet is coming and going, sometimes the computer is crashing. Not good at all (T12)*

Here is insufficient on some issues. First of all, the internet connection is not good. Internet connectivity is often degraded and slow (T9).

Besides the lack of infrastructure, the other problem mentioned by the participants was that the infrastructure work was not progressing in a planned way. Unplanned infrastructure as well as the lack of electricity were causing the disruption of education.

The infrastructure is currently inadequate. The education lags behind because the infrastructure is subsequently made. The building should be built considering next thirty years, not next three years, the infrastructure should be built accordingly. This school was at bad state for three weeks. We came here to do the cleaning first, then we started class. Why? Because these infrastructure works are done now. If the infrastructure had been built before the buildings were built, education and training would be never interrupted (T19).

Moreover, one participant mentioned about the failures in the design of the classrooms in consideration of the equipment to be used. The equipment were placed in the classrooms but the compatibility of the classes was not checked:

The work done is positive but I am opposed to the fact that it is done without creating the substructure of the works. For example, we started using tablets in schools, but when we use tablets, we do not check whether the ventilation of the class and the conditions of the class are available or not (T13).

4.1.2.3.2. Technical Problems

Technical problems referred to the problems with technology that the participants faced in the school environment Finnish and Turkish participants mentioned similar problems. These problems were related to internet network and incompatible systems. The S. Korean participants hardly mentioned the technical problems. There was just a participant who talked about internet security.

Finland

Finnish participants addressed the major technical problems encountered as not having a Wi-Fi in service (n=6) and incompatibility of the operating systems (n=5). The participants were aware that there was always the possibility of a technical problem. But, of course, they also knew that the infrastructure and equipment must always be in operation for the classes to be successful. The most mentioned technical problem by Finnish participants was not having a stable Wi-Fi in service with a high speed all the time. They wanted to have a stable and high speed internet to use online tools effectively.

Second most mentioned technical problem was incompatible systems. Bringing your own device, using different brands of computers, tables or phones were causing incompatibility. Moreover, some of the participants stated that the format of some documents and specific software were not compatible with every device. This also caused the difficulty of use.

> *There are many different kinds of smartphones for instance. There are difficulties with iPad. I cannot connect my iPad to my pc because they are separate firms and brands. There are different operating systems. That is a challenge to schools (F7).*

S. Korea

In S. Korea, the focus was on security. Even if "teachers face technical limitations" (K20), the main concern was having a secure internet:

> *…Sharing Wi-Fi with students - not with teachers- is illegal… [There is Wi-Fi for students] in a very restricted area, like around the library and in the computer rooms. But we cannot use in the classroom. That's illegal…It is a regulation of MOE because of security concerns… Especially in our school, it is really uncomfortable to use it, because the technology doesn't work well all the time, it is not well-organized, kind of messy environment (K2).*

Turkey

Turkish participants also pointed out the major technical problems encountered as not having a Wi-Fi in service (n=4) and incompatibility of the operating systems (n=5). One individual stressed the importance of not frequently encountered technical problems for the use of technology:

> *There should not be a problem too often; the smart board in the class that you have observed has gone to the technical service many times. Then how necessary is this smart board? If such problems do not occur, there is no problem. They are preventing us from using technology in the classroom (T10).*

Some Turkish participants (n=5) said that the use of tablets was not effective because there was a communication problem between tablets and smartboards distributed as a part of the Fatih project. Although the communication between these devices was a promised feature to have, it was never established. Since the tablets and the smartboards could not be integrated, tablets were not used in the classroom by either teachers or students. Students use them to play games instead of using it for educational purposes.

> *We have smart boards tablet, but apparently… Because these smart boards are totally out of compliance with tablets. We have not been able to connect the board to the tablet ... You have never used or been afforded the opportunity to use the technology…It was just a nice toy for kids (T4).*

4 Turkish participants indicated that the use of a low speed internet was a technical problem adversely affecting the education in the classroom. Because watching a video from the internet or downloading a file were turning into a waste of time. Moreover, the internet access was restricted up to a point by MoE, which constituted another part of having a Wi-Fi in service issue. Due to this restriction, the desired knowledge or resource could not be reached.

> *Our internet at school is limited. In fact, it's nothing to do with school. It has to do with MoE. For example, I have to open a song about a topic. I*

can not open the video directly on YouTube in the class. I have to set it up a few days in advance. Because the internet is sometimes slow. We just watched a movie, it was continually lagged. Sometimes the internet is not connected, you can not access every site anyway (T6).

4.1.2.3.3. Maintenance & Support

Maintenance and support referred to the actions taken to ensure successful post-implementation use of technology. Maintenance and support can be provided by staffed technicians or some voluntary people with the required competency or this service can be outsourced too.

Under this sub-theme, 17 Finnish, 17 S. Korean and 19 Turkish participants commented on the situation regarding technology maintenance and user support. In this study, Finland had a variety of ways to supply maintenance for the existing technology and provide support for the users that included an assigned teacher or a group of teachers including a person who was a part of the school system, someone from the university computer center, a member of the city board, through a project and/or an outsourced contract. S. Korea had a more professional approach against the maintenance and support services: A professional technical stuff, a contracted outsourcing company or the computer science teacher and/or science and information division of schools would provide the maintenance and support. In Turkey, there was no technical staff available at the schools. IT teachers would have the primary responsibility to solve the maintenance related problems and provide support. In the schools that were taking part in the FATIH project, if the problem could not be solved by the teachers, the contracted company that provided the tools would be called. Otherwise, the administrators would make the necessary repairs by using the school's budget if they were not within the scope of the FATIH project.

Finland

In Finland, maintenance for the technology and support for the users in schools were provided by an assigned teacher or a group of teachers including a person who is a part of the school system, someone from the university computer center, stuff for technical support paid by school, a member of the city board, through a project and/or an outsourced contract.

If the teachers themselves can not solve the problem, they primarily seek the help of a teacher assigned for this duty or an advisor/coordinator if there is any available at the school. After that, they would call the city board for further assistance.

Finnish participants expressed that the teachers who provided support and help during the maintenance process mostly voluntarily did this or upon emerging necessity. Some shouldered this responsibility for a very small amount of money since they are interested in it.

> *All the Joensuu schools have 1 person per school, someone who knows about the features of the computers, a teacher who does the technical support for 2 hours per week… They get paid for 1-2 hours per week. They don't need to be a teacher from computer sciences, they can be a teacher of whatever subject. It is enough to have some basic skills (F5).*

The training schools attached to the universities sometimes demanded staff from the university computer center. Some schools had stuff for technical support and the school paid for them if they had enough budget. Also, the schools were able to ask for help from city board staff depending on their leasing contract. The schools received the necessary assistance from leasing company owned by the city board under their terms of contract. The school paid for the leasing including maintenance services. The problem about this system was that to get the required help was taking much time or it was received very late because all the schools in Joensuu were being served at the same time. Moreover, they only provided technical support, not pedagogical guidance.

> *We have the computer company that is owned by us as Joensuu city board that works for all the schools and for the whole city. They bring us the computers, if there is something wrong we send message and they come for maintain (F5).*

It is from the city board. Computers are leasing. City board needs to maintain and update them. But, they don't come immediately. If we have problem in computer they come in 3 days, but if we have problem in network it takes longer. Because they maintain all the schools in Joensuu (F4).

Only one of the visited schools (training school) in Finland had a non-teacher (IT engineer) advisor. This person gave technical support and constantly conveyed information related to the innovations to the teachers. So, all the participants from that school including himself (n=4) referred to the advisor as a person who provided maintenance for the technical infrastructure and support. The participants (n=3) were very satisfied with the presence of such a person. But again, the shortcoming in this case was the lack of pedagogical help.

I think there are enough help at the moment. Of course, there are sometimes problems in internet connection, like now, but usually these have been solved quickly. And we have a very good ICT adviser-Aleksi. He is great and we are lucky… Aleksi, he knows everything… I don't expect that Aleksi tells us how to teach with something but he can tell me how something works. And then I can decide (F14).

I don't design the classes much I just give them the tools and the knowledge and perhaps some best ways to use them. They come to talk with me and we plan together how to use that thing (F15).

They could buy devices under the project and also provide necessary maintenance and support within the scope of the project. The downside, however, was that this help and support were cut off when the project was over. Therefore, sustainability loss and future problems could be experienced at the end of the projects.

S. Korea

In S. Korea, maintenance and support were provided by professional technical stuff, a contracted outsourcing company or the computer science teacher and/or science and information division of schools. Most of the schools in S. Korea had professional technical stuff who maintained facilities and equipment. They were paid by the school.

10 S. Korean participants stated that their schools had technical staff who were only interested in maintaining the equipment.

> *In our school, there is a technical center… They are paid by the school (K3).*

> *There is professional technical stuff at school. They take immediate action in case of technical problems. They are also in charge with the long-term maintenance (K14).*

> *Technical staff is working just for the technical infrastructure maintenance (K13).*

A division of ICT education or Science and Information in the school, computer science teacher and teachers also provided technical support even if they had a technician who occasionally visited the school. Teachers and division members were assigned for this work by administrators. One of the participants pointed out that providing support for hardware and software facilitated technology integration. Moreover, schools were making contracts with companies to get help with more serious problems, even if they had technical staff or the teachers who were assigned for the job.

> *A head teacher of science and information, a teacher in charge of smart learning and technical staff maintain technical infrastructure… Providing H/W and S/W support enable technology integration (K15)*

> *A computer technician visits the school once a week for the service… Science and Information division maintains the technical infrastructure (K17).*

> *Some teachers control the systems, computers and facilities for teachers and students. But more specific and sophisticated ones or technical problems are fixed/ conducted by companies… School does a contract with them not the government (K6).*

One of the teachers expressed his belief in that if the teachers were not assigned specifically for technical assistance, they would not care about this issue and help with the problems accordingly.

> *We have 2 engineering teachers… Just like electronic engineering… But they are not in charge of managing things like that in this school. It is really important for us to have them because they have their own job besides the lessons. If that's not your designated job, they never do it. For example, for this year it is not their job, so they never care about it (K2).*

Another two teachers commented on delayed or late technical assistance. Although one of them did not seem very uncomfortable with this situation, the other one said it was a waste of time.

> *Technical education teacher or the IT department maintain the infrastructure and devices in the school… The professional maintenance and repair services are always delayed, yet it is not much of a discomfort (K19).*

> *In our school, it is really uncomfortable to use technology, because the technology doesn't work well all the time, it is not well-organized, kind of messy environment… Of course, they [computer people] help us, but the courses are only for 45 minutes, we can't get really instant help and this is very time consuming (K2).*

Turkey

In Turkish schools, Information Technology (IT) teachers mostly take care of infrastructure related problems. Most of the Turkish participants (n=15) pointed out that the IT teacher, if there is any, was the first person to be consulted for the solution of technical problems at the schools. Despite this approach towards IT teachers, The Unit Coordinator of Education Information Network at MoE claimed that IT teachers were helpful in terms of software, not the hardware problems.

> *Of course, IT teacher helps. But not at the hardware level and only at the software level. If there are missing applications or software programs that need to be installed, IT teacher is setting it up whe n it is needed (T21).*

When the teachers could not solve the problem, if the schools were within the scope of Fatih Project, the school would seek for technical assistance from the company –VESTEL- that distributed the devices. The visited high school had tablets and smart boards within the scope of FATIH project. All interviewed participants including IT teachers themselves in this school (n=10) stated that the IT teachers would try to solve the technical problems initially and then they would request further assistance from the professionals employed in the project. A high school biology teacher further noted that:

> *Computer teacher is trying to solve the problems that occur in the school environment within her competence level. If the problem can not be solved by her, she is being assisted by technicians in the education technology office.* We apply to *the Ministry of National Education regarding the problem and they send the responsible person for the smart boards ... Computer teacher determines the problems, the necessary assistance on that issue is provided by the government (T5).*

These statements were supported by the coordinator:

> *The software issues related to smart boards, printers and tablets distributed within the scope of FATIH project are solved by IT teachers. But if there is a hardware problem, it is reported to responsible units. There are contact numbers given to the school administration, when the devices are installed. They make phone calls and* a *technical service unit come and do the necessary actions. They change it if necessary or repair it (T21).*

The possible problems about maintenance and support provided within the scope of project might emerge after 5 year warranty coverage and end of the contracts. In this case, when the agreements' validity expire, the school would still have to pay the technical service fee from its own budget. It was observed that IT teachers did not like to keep the infrastructure well-maintained. It was obvious that it wasn't a voluntary job. Moreover, the teachers had to do the technical service that actually had to be done by the responsible technicians. An IT teacher explained:

> *I feel like a repairman. For example, a computer is brought in and you need to repair and run the computer. It is like there is nothing more to it, you never get to do anything to literally improve yourself. Normally a formatter teacher [of FATIH Project] only needs to check and do the maintenance of the laboratories and the devices in the school. However, they lay the workload over these formatter teachers that is to be handled by the technical service originally (T11).*

She further noted that even if there was a formatter teacher in schools, she believed that the formatter teacher was usually interested in the technical work of the administrators. So, this didn't help technology integration process. Not only the administrators, but sometimes the computer teacher did not allow the other teachers and students use the computer lab other than during the computer classes, since the computers or keyboard and mouse could be damaged by them.

> *Our computer teacher is very sensitive about the computer lab. Because he says that they get broken if we do not watch for it. I have been speaking of it in the past years; some allowed, some did not. The ones who allowed their usage lift the keyboards and mouse up to their cabinet and hide them. So we were having trouble. We do not want it like that anymore (T18).*

Moreover, it had been observed that IT or formatter teachers' involvement in technical work more often may cause unfavorable effects on the quality of both teaching and learning process and technical work to be done. This observation was supported by the explanations of a formatter teacher from a high school:

> *I teach elective computer courses, but, in fact, I have no obligation to teach classes. Because I am not a computer teacher and only computer teachers can teach these classes. I can teach arts and crafts, but that class is not available in this school. However, I have to give the classes even if it is not legal, because they are chosen by students and there is not any other qualified teacher to do it. 10 hours of computer lessons a week prevents me from doing my own work: When I just start the class, other teachers ask me to visit their classrooms in order to fix the interactive boards. I leave the students and go to the other classes. I'm forced to leave the students as soon as the class starts and, when I just managed to gather their attention. And when I come back, I find the students already become distracted (T9).*

There was no technical staff available at the schools (n=21). Besides, IT teachers, the ones who had the most knowledge about technology use and repairment of it, had to help with maintenance and provide technical support (n=7). In some schools, even an IT teacher was not available or IT teacher had inadequate technical skills to handle the maintenance and repair. So, some teachers said that they could feel the lack of knowledge in those teachers accordingly.

We do not have such a technical stuff. Formerly, there was a system of "computer formatter teachers". The formatter teacher was really helpful. He helped even with the slightest problem. He was doing his best. Because he had the technical knowledge. Now, if there is an IT teacher in a school, MoE doesn't assign a formatter teacher. Our IT teacher says I can not deal with the technical part. Qualified teachers are required. We're trying to manage it on our own (T18).

Since no technical assistance was available, efforts were being made to prevent failures and breakdowns by restricting the use of the devices (n=2). This also restricted the use of technology:

We have a computer lab. Our computer teacher equipped it by the help of her husband. She covered all the expenses. Yenimahalle Municipality also helped us in that regard. But she does not let us use the lab. We never get to use it. She says that the computers give failure, and then she has to fix them and she is not able to focus on her own self improvement (T18).

The administrators managed to make necessary repairs by using the school's budget if they were not within the scope of the FATIH project (n=7). Additionally, the budget of PTA would be used for service purchase.

The school pays the external service fee from its own budget. There is not a governmental unit that we can call for. This is something all about us (T20).

Technical maintenance of the devices and the equipment is again something what a computer teacher does. But, when money is needed to solve the hardware problems, we are all trying to meet this need together with the parent teacher association (T13).

4.1.3. Summary of Macro Level Issues

A summary of Macro Level Issues was provided in Table 4.2. The summary display of a very extensive data and findings of a very detailed analysis could be seen summarized below in order to provide easy navigation and a rapid understanding of similarities and differences between countries. The numbers in parenthesis showed how many participants mentioned the related issue, while the letter O refers to the observation.

Table 4.2. *The summary of Macro Level Issues*

Summary of Macro Level Findings						
		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories			Findings at first Glance	
Guiding Principles	Policy Satisfaction		Satisfied (9) Not easy to implement the high standards (6) Differences in theory and practice (2) Open for improvements (2)	Government investment (11) Algorithm based education (4) Difficulties in implementation (6)	Fatih Project (11) Lack of planning (5) Differences in theory and practice (3) Lack of collective decision-making process (5)	• Finland showed satisfaction of existing policies. • S. Korean government had big investments in advanced technologies. • Turkey had a government backed project named FATIH, but due to lack of sufficient planning and lack of involvement of the teachers in the process, the project seemed as a failure in practice. • Gap between theory and practice existed in all countries.
	Policy Makers		Discussions and research Collective decision-making process (O)	The ultimate authority Presence of understanding of ICT (1)	Complete power an d authority A top-down hierarchical structure (8)	• Finland had a more democratic approach to policy making. • S. Korean policy makers were the absolute authority, but at least they were aware of the importance of ICT. • In Turkey, authority of policy makers was the sole and the absolute.
	Curriculum		Difficulties in implementation due to the flexibility of the curriculum (8) Lack of clear boundaries and guidelines (8) Fortcoming school curriculum and school	The flexibility of the curriculum (8) Lack of clear boundaries and guidelines (8) Reduced focus on teaching the use of machine itself (4)	Lack of clear boundaries and guidelines (8) Extensive content versus inadequate number of teaching hours (6) No sufficient time to include ICT (3) Exams (2)	• In S. Korea and Finland, no clear guidelines and boundaries for ICT use. But, Finland had the opportunity to make the national curriculum more feasible with the help of school curricula. • In Turkey, not enough number of courses to teach the extensive content included in the curriculum, so no sufficient time to include ICT use.

Summary of Macro Level Findings

		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories	Findings at first Glance			
			curriculum in operation empowering ICT use (12)			
	Administrative Supervision		Change in testing and curriculum policies (8)	Curriculum and policies (2) Final exam policy (2) Traditional teaching and learning culture (3) No teacher supervision and evaluation policies (2)	FATIH project requirements (2) Lack of feedback or lack of any enforcing regulations (3) No evaluation policies (3) Curriculum (7) Testing policy (2)	• Finland updated testing and curriculum policies, and they would help technology integration. Participants welcomed the change. • S. Korea had a traditional teaching and learning culture, for them changing the mind-set was so difficult if it was not dictated by curriculum and policies. Final exam policy and no evaluation policies for technology use prevented teachers from using technology. • In Turkey, FATIH project contributed teachers' use of technology, however due to lack of feedback and enforcing regulations, it was unclear how much or how effectively the teachers actually used ICT.
Determinants for ICT use	Educational Inequality		Limited opportunities for local schools (6) Training schools being superior (6)	Public schools had standardized opportunities (O)	Inadequacy of physical conditions in schools (4) Lack of standard technology and material distribution (2) Inability to meet basic needs (2)	• Finland had the uneven allocation of the budget among the schools. There were standard equipment available in each school. Only in some schools, there were much more equipment available. • In Turkey, if the school was not involved in FATIH project, their technology resources were limited. Some schools were in need of high-priority basic needs to be met.

Summary of Macro Level Findings

		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
	Financial Limitations		Present (16) Lack of budget for technology purchase (7) Alternative solutions (16)	Present (5) Lack of budget for the purchase of renewing and updating existing devices (5)	Present (6) Lack of sufficient budget if FATIH project was not implemented yet in the school (6)	• Finland tried to make the best out of available recourses • S. Korean government had no problem about initial purchase of devices but they were short in budget for the purchase of renewing and updating existing devices. • In Turkey, if FATIH project has not yet begun to be implemented in a school, the need for technology was ignored in those schools.
	IT infrastructure & Logistics	State of Infrastructure	the inadequacy of the current number of equipment (11) A need for modern technology (2)	The adequate hardware infrastructure at the schools (8) Wi-Fi problems (2)	Not a sufficient technological infrastructure and lack of equipment despite the presence of FATIH project (17) Unplanned infrastructure set-up (10)	• Finland had a certain level of infrastructure and equipment in the schools, but the number of the equipment was inadequate. • S. Korean participants didn't complain about the inadequacy, they just experienced some problems with Wi-Fi. • Turkish participants was not happy with the existing infrastructure and equipment despite the presence of FATIH project. They claimed that the FATIH project caused a downsizing of the budgets allocated for the other schools that were not involved in the FATIH project.
		Technical Problems	Lack of a stable Wi-Fi in service (6) Incompatibility of the operating systems (5)	Internet security (1)	A low speed internet (4) Incompatibility of the operating systems- Tablets and smart boards (5)	• Finnish and Turkish participants mentioned similar problems: Lack of a stable Wi-Fi in service and incompatibility of the operating systems. • The S. Korean participants hardly mentioned the technical problems. There

Summary of Macro Level Findings

		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories	Findings at first Glance			
						was just a participant who talked about internet security.
		Maintenance & Support	An assigned teacher or a group of teachers including a person who was a part of the school system (3), someone from the university computer center (2), stuff for technical support paid by school (3), a member of the city board through leasing contract (8) Voluntary or a very small amount of payment (6)	Professional technical stuff (10), A contracted outsourcing company (4) or the computer science teacher and/or science and information division of schools (6) Delayed help (2)	Information Technology (IT) teachers (15) Technical assistance from the contractor company – VESTEL- for FATIH project components under the warranty (10) No technical staff available at the schools (21) using the school's budget (7) Preventing failures and breakdowns by restricting the use of the devices (2)	• In Finland and S. Korea, there could be a technical stuff at the school. Maintenance and support were mostly provided by professional technical staff who got paid by the school in S. Korea, while leasing companies and responsible teacher would help too in Finland. • In Turkey, IT teachers would respond to the failure initially. Then a technical assistance from the company as warranty requirement would help if it was a school involved in FATIH project, otherwise school would pay from allocated budget.

4.2. Meso Level Issues

Unlike the macro level issues reported previously, meso level issues were focused on the structure and culture of the schools themselves (Bronfenbrenner, 1994; Jeurissen, 1997). In this study, the meso-level issues related to the technology integration into education were concerned with the relationships and patterns in the school environment that consisted of school and ICT leaders, teachers, students, and parents. Meso level issues included 3 main themes: School leadership, participatory involvement and teacher development. Table 4.3 below presented the issues and sources of meso level.

Table 4.3. *Meso level issues*

Meso Level Issues	Sources	F	K	T
• School Leadership				
o Provision of Resources	46	16	14	16
o Encouragement & Support	34	10	10	14
o Community Capacity Building	16	7	4	5
▪ Shared Vision	43	15	14	14
▪ Shared ICT Leadership	19	13	-	4
▪ Professional Learning	21	9	5	7
o Permissiveness	22	10	4	8
• Participatory Involvement				
o Community of Practice	39	15	14	11
o Informal Knowledge Exchange	30	16	4	10
• Teacher Development				
▪ Teacher Knowledge & Skills	33	10	10	13
▪ Professional Development	52	19	15	18
❖ Training Content	44	16	11	17
o Parents	23	6	4	13

At the meso level, the leaders referred to not only principals but also administrators at any level and also ICT leaders. Those who formed school-wide policies and curricula, designed instructions and trainings were considered as leaders, since their perspective would have an impact on technology design and use (Chai et al., 2014). How leaders could shape the use of technology in education was reported under ‘School Leadership’ including positive and negative opinions accordingly. Provision of resources, encouragement and support, community capacity building were emerged as the defining characteristics of the leaders. Community capacity building were categorized into three: Shared vision, shared ICT leadership, and professional learning.

Participatory involvement was emerged depending on whether there was the use of a community of practice for teachers and informal knowledge exchange among the school community in order to enhance technology use in the process of both teaching and learning. Teacher development covered the sub-themes that presented the processes supporting teachers to develop their own methods and expand their pedagogical knowledge regarding technology use in the classroom. Under this theme, teachers' knowledge and skills and also their professional development levels regarding ICT use were discussed as the sub-themes and training content as a category was reported under the professional development sub-theme to mention the scope of teachers' training courses.

Lastly, under the theme 'Parents', the involvement of parents in the process of technology integration were described. Because, the evidences revealed that the parents were involved in some decision-making processes that were applied at schools. For this reason, affirmative or negative attitude of the parents would have an impact on the decisions made related to technology use in schools.

4.2.1. School Leadership

Under this theme, the role of the school leaders and their responsibilities for an effective technology integration were reported. The leadership was considered as a guidance in integrating technology in teaching and learning processes as well as helping others in schools in order to create ideal learning environments for students. In this context, the schools leaders referred to not only the administrators (principals and vice principals) but also technology leaders (the administrators, teachers and coordinators).

Based on the interviews and observations, majority of the participants from Finland, S. Korea and Turkey agreed on that the school leaders played a significant role in technology integration at schools. The comments below clearly highlight the importance of strong leadership in the full realization of ICT use in schools:

> *There are a lot of differences between the schools. It really depends on the principal. If the principal is willing for the school to develop in use of ICT the school will develop, if not the school will not develop (F5).*
>
> *In fact, there are no obstacles [in relation to the use of technology in education or lessons.] There are only unmotivated teachers and school administrators (T21).*

Although it was widely agreed that school leadership played an important role in technology use in the classrooms, the comments about the role of leaders and their attitude varied amongst the countries. The following were reported as the themes attributed to school leadership: provision of resources, encouragement and support, community capacity building (shared vision, professional learning), and permissiveness.

4.2.1.1. Provision of Resources

Provision of resources meant providing the components that must be present at the school for technology integration in this context. Under this sub-theme, provision of resources referred to the allocation of budget for the purchase of equipment and services required. A sub-theme that widely emerged among participants was the provision of resources issue among the responsibilities of school leadership. Principals were seen as the provider of ICT infrastructure at the schools. Since the principals were the authority to decide whether the money would be spent on technology purchases or not, the majority of participants (n=46) indicated that the purchase of technology strongly depends on principals and what they give priority to.

In Finland and S. Korea, the participants agreed that provision of resources for technology integration was the responsibility of the administrators. S. Korean schools had an allocated budget for the purchase of ICTs. Even if Finland didn't have a specific budget for it, they would manage to purchase technologies through projects. Additionally, the administrators would discuss the needs with the teachers, city board and the committee providing the equipment and the economic resources. In Turkey, the participants wanted administrators to make the current technology available and keep them running. Interestingly, the administrators had a tendency to purchase up-to-date technology for themselves first.

Finland

More than three-fourth of the Finnish participants (n=16) defined one of the roles of principals as providing money for the equipment. One participant stated that "*she has a big role because she controls the money. Our principals are the way that we believe we should go. The education is growing to use more ICT* (F8)". Other four of the participants suggested that if the school budget managed by the principals was sufficient, the principals could try to spend it more wisely to meet the needs better. However, they sometimes seemed to struggle managing and allocating a budget to provide the required equipment.

> *Yes [we can hire a person for maintenance of computers], but it is always about the money. You could, the headmaster [the principal] could, but she has to think how to spend the money to be enough for everyone and we can't do everything… I think their role would be finding the money for the equipment (F11).*

From not only teachers' perspective but also the principals', the principals were responsible for creating resources to support ICT use. In this regard, an elementary school principal and two principals from two different training schools defined their role as provider of resources for students and teachers.

> *I deal with economic issues as well, like I make sure that students and teachers can get good machines and tablet computers to do their job (K12).*

The role of principal is very important of course, because how to use the economic resources of the school depends on the school leaders (F3).

Another principal from a high school as well as the ICT coordinator at Joensuu City Board explained the relationship between provision of resources and the priorities. Priorities according to the principals would determine how the budget would be spent:

The leader gives the kind of thoughts to the teachers that, if it is ok or if it is something that they are not interested at all. If he promotes the teachers' education, buying the computers/iPads/mobile phones /GPS devices whatever school needs. Then of course there will be more use of ICT in those schools. In some other schools if the principal says 'no, it is more important for us to buy new chairs and books than computers', it really doesn't encourage the teachers to use ICT (F5).

Additionally, an elementary school principal mentioned that if the school had the required budget, her priority wouldn't be hiring technician or buying devices, instead, she stated that she would improve teaching quality by reducing the number of students in a class or increasing the number of teachers per class. A primary school principal pointed out that making the decisions regarding the purchases were not depending on only the principals. They needed to discuss it with the teachers and city board, which is the committee providing the equipment and the economic resources.

In Finland, the school budget was provided to the schools by the city board. If there was a need for extra money, the principals needed to consult with the city board first. However, the consultation didn't mean that they would get what they needed for sure due to the bad economy. A classroom teacher at a primary school explained the situation:

For an effective integration, we should have working wireless and more IPads. We currently have 9 Apple TVs and 6 smart boards, a few interactive projector, and document cameras we have in every classroom… These come from school, not from a project… The principals has money and sometimes they buy these kind of staff. But, the city board sometimes deny the principals' request and we can't buy anything. Our principal can't, it was denied from the city because of economy. The

> *economy is so weak in the city, so we can't buy anything even if we want to (F10).*

If they could not get extra money from the city board, then the principals would be the responsible ones for finding new ways to provide money or equipment for the school on their own. One of the way of providing necessary equipment was being involved in a project or creating a project and apply for a budget specific to it. That was because "*in some schools because the government sometimes might give money easier for technology than if you need money for a new desk* (F2)".

S. Korea

In S. Korea, 14 of those interviewed clearly reported that the provision of resources was in responsibility of the administrators. Their responses were more consistent, than the answers gathered from other participants from Finland and Turkey, regarding that the administrators' being the ones who were supposed to build the infrastructures at schools and provide the necessary equipment for a better education:

> *The responsibility of school management is building infrastructure, providing financial support and human resource (K11).*

> *School compiles some budget to buy software for education (K13).*

There was a budget allocated only for ICT- related purchases (n=3). A computer teacher at an elementary school explained the budget in detail as follows:

> *There's an annual budget for educational software such as video, courseware or web sites… Our school has two computer laboratories and each one has 30 computers. There is a computer, a printer, a 42inch-sized TV, wired internet connection through LAN, MS office package, MS windows in each classroom. In the material room, there is a scanner, some color or laser printers, plotter. This is an annual budget for ICT (K10).*

No.	Item	Budget (Won)
1	Toners for printers	8,500,000
2	Educational software	12,561,000
3	Maintenance for Network and PC	5,480,000
4	Communication expense	6,000,000
5	Cost of IT assistant	17,639,000
6	Lease for color printers	3,600,000
	Total	53,780,000

Even if there was an allocated budget to it, it was regarded as not enough for a good technology integration in the classrooms. In this context, again, the task of providing financial support was perceived as the role of administrators (n=2). Verifying the words of teachers, the principals in S. Korea also indicated that their role was providing a budget to ensure that the prerequirements for the ICT use in education were satisfied.

> *We actually have budget for it, we usually use that money for projectors and computers for students and teachers (K1).*

> *As a principal, I want to support the infrastructure for teachers and students. I have vision to make it broaden. So, someday we will use it more and this will be more helpful and successful (K6).*

Turkey

The majority of Turkish participants (n=16) suggested that the administrators should support the teachers by providing components of a working infrastructure at schools. For example, the 6 interviewees from Turkey argued that the school administration supported the teachers by providing the necessary infrastructure.

> *Our administrative support is strong. The projector we have in my classroom was purchased upon our principal's individual effort. It is impossible for ICT to form and develop without the infrastructural support. If the teacher is an integral part of this issue, the school's approach and the infrastructure establishment should be another integral part of it as well. An adequate support and a strong infrastructure will help to promote the integration of technology. The role of school management in purchasing of both the computers and the projectors is very large and precious (T15).*

One of the most striking statement about the role of the administration was that the administrators were disposed to act upon their needs rather than thinking of teachers' needs in the name of enhancing technology integration in the schools, but it had to be the otherwise indeed.

> *They [administrators] need to emphasize that the existing technologies are open to the use of teachers. For example, they should not place the scanner or photocopy machine in their own room… While a principal is buying a computer for himself, he shouldn't place only one computer in the teachers' room. A principal must be sure that the internet is accessible in the teachers' room too, instead of cutting the connection to improve his own internet speed. These are the things that I experienced, that is why I am just saying it (T21).*

Some of the participants (n=3) emphasized that because of the limited school budget, sometimes the school management could not help even if they wanted to. They claimed that the school needed to spend money on different things as a priority. Only a small number of respondents (n=2) indicated that school management needs to meet the needs somehow even if they do not have a budget allocated to it. They supported the idea that technology integration could be performed even more effectively, not only by spending money on ICT purchases, but also by providing access to the technology that was currently available at school.

> *There is not such a large amount of money distributed to schools. The budget only covers for the expenses such as electricity bill and natural gas. Teachers are given with a very little amount of paper to use for photocopies. Everything is still mostly done with donations, but the government does not want us to take donations... The school does not have the chance to develop new policies regarding the technology, if they did, they would do it. However, school administration can still provide the necessary help. For example, the computer class can be accessible by all teachers. In addition, projectors and computers for the classrooms could be provided by cooperating with the parents and parent-teacher association. The school administration could contact with the ministry to provide materials (T19).*

Some of the Turkish participants indicated that the role of the administrators was keeping the equipment and systems available and running efficiently (n=6). The provision of up-to-date technologies in-service was more important than increasing the number of the devices. However, all the participants who responded in this manner were from a high school within the scope of FATIH project. These participants did not already have a problem with the access to technology as the other Turkish participants.

> *The school management has an important role [in terms of supporting the use of technology in education]. In order to keep this system working, existing technologies must be kept available for continuous use. School management therefore plays an important role. If there is a problem, the management needs to find a way to eliminate it. In this regard, I think our school administration is willing to solve the problems (T7).*

4.2.1.2. Encouragement & Support

Previously, the provision of resources was reported as one of the administrators' roles. As this sub-theme can not be considered independent from the previous sub-theme, encouragement and support of the administrators were also seen one of the responsibilities of school leadership in order to enhance technology integration in classrooms. In this context, encouragement and support referred to the administrative encouragement and support that promoted the use of technology among teachers.

In Finland and S. Korea, the administrators were encouraging and supportive as well as in Turkey. However, in S. Korea and Turkey, if teachers didn't request for anything from the administrators, they wouldn't take the lead and do something to contribute to technology integration. Additionally, in Turkey, unless FATIH project was in operation, the administrators would not make any effort regarding the technology integration and not tend to prioritize it.

Finland

The majority of Finnish participants thought that the administrators had an important role for technology integration into education. They also suggested that the encouragement and support supplied by the administrators promoted the use of technology among teachers. Almost half of the Finnish participants (n=10) claimed that they have an encouraging and supportive principal in charge. Additionally, two of the participants pointed out that being encouraging and supportive was a feature that comes with having a budget satisfying the needs.

> *I think management is not a problem or maybe second important thing after money for technology integration process. The money is an issue for supporting ICT in education… I think we have quite good principals, our principal likes that we use ICT (F4).*

In Finnish schools, eager and skillful teachers were assigned to do the ICT-related work of the school with a small fee. One of the principals explained how he supported voluntary and willing teachers in the school:

> *One hour time is paid for each week. Small amount of money added to his salary. But I try to make that he can make those things during the schooling time, not in the evenings or at the weekends. In our case, they really want to do that work and they know what they are paid for it. But anyway, they want to do it because they see it very important. It is almost voluntary. All together it is about 100 euros per month (F7).*

S. Korea

Almost half of the S. Korean participants (n=9) stated that their administrators encourage and support them to use ICT in the classrooms while only one participant complained that there was not enough support (K20). Some participants explained the encouragement and support that provided by the school leaders in their schools:

> *In general, ICT use in classrooms is encouraged and various devices are equipped in classrooms…In general, ICT use is encouraged for better education (K18).*
>
> *The school tried to help us as much as possible, and I do not have a serious complaint… I think he [the principal] does understand actual value of use of technology due to its benefits. Because the use of technology provides high learning capacity in class (K19).*

The school leaders in S. Korea did not seem to opposing to the content that the teachers wanted to use in the classroom and they were likely to accept teachers' ideas voluntarily. Two S. Korean principal also confirmed that they were being open minded against the new ideas submitted by the teachers related to ICT use in the classroom and they encouraged them to use ICT. Two participants further explained that the principals were proposing awards to encourage teachers to use ICT. For instance the English teacher's statement was as follows:

> *He has to have constant attention and actively promote for teachers. Give the extra points for promotions… Basic contents are provided for supporting basic inclass use (K17).*

It was crucial to note that one of the S. Korean participants claimed that the lack of support was not because the school administration was reluctant, but it was more about that the teachers did not demand for the support in the first place.

> *Supporting is wrong word here. If the teachers go to principal or vise-principal and ask for it, they are definitely going to try to help. However, at first place we never ask, that's why it [support] is not happening (K2).*

Turkey

In Turkey, the school management was supportive of the technology integration according to 14 Turkish participants in general. A common view amongst interviewees was that the administrators mostly had positive attitude towards educational use of ICT by responding to teachers' needs. A vice-principal explained their role as ensuring that the technical assistance was provided whenever a teacher needed it. The reason for the act was that the FATIH project was kind of holding them responsible to be supportive.

> *It is one of our most important duties to take immediate action to solve the problems whenever they have any requirements regarding the technology. After all, we have to support it regarding this project [FATIH], we have no alternative anyway (T2).*

However, some interviewees (n=3) argued that the administrators were not always all supportive, while a participant indicated that they remained neutral and did not make any attempt, because this was not a priority at that time.

> *I think they would support, because I do not think they would have a negative approach to it. But I do not think they're too involved in these issues either. It's not on their agenda (T12).*

Interestingly, one interviewee alluded to the notion that the school management supports the use of technology, because the inspectors assigned by the government are pleased to see the use of technology during their visits.

> *The school management is always positive about this issue. It may change according to school, but the school management likes the technology too. This serves their purpose as well: When an inspector visits here, technology is being used actively at our school and they say that our teachers are using smartboards. In this respect, this is good for the management too (T5).*

Additionally, some participants (n=4) expressed the belief that since there were no requests or suggestions related to ICT use coming from the teachers, the school administration did not seem actively working on this issue. They claimed that in fact, the school management always supported teachers to use technology. At the same time, they were open and supportive to the new ideas and projects that would be suggested by the teachers. However, the teachers' desires and efforts may be the missing part here.

> *School management supports the use of technology, and if it is used, there is no objection at all. They support it, but we are not able to use it much ... School management is open to all kinds of projects, they support us and provide moral and material support, but we do not have many teachers who want to do a lot of projects, things that are related to technology. That's the actual problem. Otherwise, especially our new administration is quite supportive. Even encouraging teachers to participate in such projects (T20).*

> *If there would be any demand from the teachers, this demand would be met by the school administration, but so far there has not been such a*

demand. No one yet made a request for help. According to the request, we would establish a contact with the relevant institution, organization or place, if necessary, we would arrange it with your university (T3).

4.2.1.3. Community Capacity Building

Community capacity building focused on the role of administrators in obtaining and improving skills, competencies, and knowledge of individuals as well as the community in a school for a more effective technology integration process. The community capacity building was categorized into three: Shared vision, shared ICT vision, and providing professional learning opportunities.

Under this sub-theme, 7 of Finnish, 4 of S. Korean and 5 of Turkish participants indicated that community capacity building was one of the responsibilities of school leadership. The principal was regarded as the key component of the school community. Some participants pointed out that the school administration had a unifying, integrative, guiding role, which in return contributed to the formation of a solid school culture. In this regard, the ideas of adopting a shared vision and a shared ICT leadership and providing professional learning opportunities were also emerged from the collected data as the components serving the purpose of building community capacity. These categories were also reported below.

In Finland, the community capacity building was seen as one of the responsibilities of school leadership. A cooperating community and a strong school governance existed in Finnish schools. The existence of the strong community ties in the process of making decisions to form a mutual understanding enabled the implementation of the decisions regarding technology use in the classrooms. A strategy formed by teachers and administrators at both school level and city level helped them to create and follow a shared vision regarding ICT use. In connection with a shared vision, a shared ICT leadership was practiced in Finland. To provide guidance for the teachers was a focal point of the shared ICT leadership at both city and school level. There were administrators, ICT advisors, a group of teachers or an ICT group assigned by the principal at school level and a coordinator at city level as partners in the ICT leadership in order to provide help and guidance in technology integration process. Sometimes, the university academicians also contributed to the process of guidance. Additionally, enabling and providing professional learning opportunities for the teachers was one of the role of administrators to empower community capacity building. Once again joint decision-making became the focal point in the professional learning process. They would discuss and decide the necessity of the opportunities. The administrators were expected to sponsor the learning activity or allocate budget for the substitute teachers while the staffed teachers were not available.

In S. Korea, the principals were the leaders of communities and a role model for teachers' further use of technology. However, there was not a predetermined strategy or a shared vision to gather around at the school level. ICT-related visions and ideas were limited to the individual level. The individuals were able to build their own vision and implement it somehow. Thus, the vision and approach of the administrators would determine the use of ICT. The ideas that schools adopted as their vision differed among each school due to principals' personal approach. In S. Korea, the shared ICT leadership wasn't mentioned in a distinctive way by the participants, so it was not reported. For community capacity bulding, providing more opportunity to enable professional learning was depending on principals and teachers, but they thought that MoE provided enough training so there was no need for extra courses. Technology use was already at a certain level according to the participants.

In Turkey, establishing trust, modeling, providing the motivation of teachers and facilitating bureaucratic procedures were the role of principals in order to empower community capacity building. But, there was not a tangible vision adopted or strategy employed in the participants' schools. A vision formed around FATIH project was considered as a mutual understanding of technology use. However, the use of technologies resulting from the project was spontaneous and unplanned, beacasue the support for implementation remained unfulfilled and the technology use was not properly enforced by the authorities or the school administration itself. In addition to not having a shared vision, there was not a discourse indicating a shared leadership. There was a more authoritarian leadership style due to a centralized educational structure. The school management's point of view was determining the school culture. Adoption of a shared leadership style as well as the creation of shared vision were depending on the school management's view itself. Sometimes a shared ICT leadership would not even be a matter of discussion since administrators, other teachers, students, and parents did not perceive computer lesson as one of the important lessons. In this context, the implementation of FATIH project being independent of the principals' authority enabled accessibility of the devices. As one of the categories of community capacity building, providing and supporting professional learning was the role of school management in Turkey as well as in other countries. However, the participants pointed out that it was difficult to get the necessary permits from the school administration just to attend required trainings as a part of the school community. Because, there was not a substitute teacher provided to replace the teachers in case of need. Furthermore, they also complained that the courses were not very organized and planned either. The time and period of courses did not fit their schedule.

Finland

In Finland, during the observations period within the teachers' room and school environment, the existence of a cooperating community and a strong school governance were realized. The Finnish participants (n=7) seemed to confirm researcher's observations by pointing out that principals are the key to a successful technology integration by building the community capacity.

> *Decisions comes in numbers; hardware, education given to the teachers, but it is also huge, because if the school management is enhancing the idea then the whole school community will enhance the idea. So it is not only about money or time, but it is also about what you will make as*

important issue for your community… Principals are the key for the community (F5).

She do give value on using ICT in education because with technology the school goes forward. The community of Finland has technology around, and we can't take school away from the technology (F8).

Moreover the principals (n=3) further noted that group discussions led by the principal were helping all components of the community to share the responsibilities and create awareness.

Our teachers are good but I think that they could use more [technology] and that is my role… It is my job to support them and let them learn more about ICT. It is my role to let our teachers to learn and study, and it is my work to say them that you can study and work… Discussing with our teachers can show that how important this is and they can start using (F9).

S. Korea

In S. Korea, there was also a collaboration amongst community. The principals were the leaders of communities and they tried to be a role model for teachers' further use of technology. Both teachers and principals were mostly focused on the exposure level of the students to technology. One participant specifically pointed out that the administrators' trust in teacher was the way of supporting ICT use in the classroom. Following statements explained the situation in S. Korea.

I try to support various ways to let the students be exposed to ICT education… Currently, there is a great enthusiasm for smart education at school, so we actively support Smart Learning community of teachers (K14).

School administrators are highly interested in ICT use in education… Yes, school administrators give value to ICT education. Because they learn how to present smart learning and prepare remote video education (K9).

Turkey

In Turkey, there was a social solidarity among the teachers, but more individual activities were highlighted at the school environment. Turkish participants generally explained how the community of teachers and the school culture would be improved to support the use of technology. They defined the role of the manager in this regard: Establishing trust, modeling, empowering the motivation of teachers and facilitating bureaucratic procedures. Two of the administrators pointed out motivation and trust issues as follows:

> *Of course, they will say; we do not have time, or there may be the ones who will say; we will have to come to the school earlier, but the schoolmaster must be effective on that. We think that we can influence [positively] our teachers at the school... Some of our teachers do not use the technology enough. I think that we can do a study for their more effective use of the technology with other teachers together, perhaps just like a professional coaching in such unity to influence them (T14).*

> *We have a trust issue. There would be no problem where the trust issue is solved (T13).*

Guidance, modelling and easing the bureaucracy would help building community capacity in Turkey. Two teacher pointed out the importance of having administrators who are educated about the use of technology. In this way, the administrators would be able to influential role models and guides. Additionally, one ICT coordinator elaborated the bureaucracy issue and the role of administrators as follows:

> *I am trying to get a formal letter from the school administration to allow the courses to be given and to provide official participation of the teachers. Instead me trying to deal with it, the school administration should say; Dear friends, we have a portal called EBA, here we have very good contents, you can use them too. Our IT teacher will give you the training for this. There should be a supportive act such as telling us to join and listen to it (T21).*

4.2.1.3.1. Shared Vision

Shared vision referred to the collective intention of individuals in the school environment to be able to move towards a common direction. The administrators could develop a strategy or school policy that would ensure a common understanding/vision regarding the use of ICT in learning and teaching processes in order to empower a successful ICT integration. In this context, as an extended part of building community capacity, establishing a shared vision and goals upon technology use in the schools were regarded as a way to facilitate technology integration. Binding individuals together into cooperative communities gathered around some shared ideas, values and beliefs was the responsibility of the leaders. In total 15 participants from Finland, 14 from S. Korea and 14 from Turkey put stress on the importance of a shared vision from different perspectives. In Finland, having a strategic plan both at school and city level as well as an ICT group in the school were the most prominent features of building a shared vision. In S. Korea, there was not a predetermined strategy or a shared vision to gather around at the school level. ICT-related visions and ideas were limited at the individual level. In Turkey, the use of technologies that were accessible within the framework of the FATIH Project was regarded as a shared vision. No explicit vision or strategy was observed in schools that had not yet been taken under the scope of this project. In addition, the presence of an explicit vision and strategy was still linked to the principals regardless of whether the school was in the scope of FATIH project or not. The participants from S. Korea and Finland did not particularly mentioned anything about a shared vision. They mostly discussed the presence of the vision itself.

Finland

15 Finnish participants pointed out the importance of having a shard vision in order to facilitate ICT integration. In the Finnish schools, there was a strong interaction and communication between school staff. For example, a teacher or an administrator would not make a decision without discussing the issue with the other teachers and

the leaders. Since there existed a point of view that the mutual understanding would facilitate implementation of the decisions better. An ICT advisor from Finland emphasized that a shared vision with the availability of the necessary tools would enable teachers' ICT use.

> *If you have the machines and some vision which is shared with the teachers, I think, that gives the help for enabling ICT use (F15).*

Some of the participants (n=6) particularly mentioned the positive impact of having a shared vision on technology integration in the schools. Following statements also proved the existence of the strong community ties in the process of making decisions.

> *Our school management want to ask what to do and not just make decisions… They get the teachers ideas then they decide… If I have some ideas, I will discuss with administrators (F1).*

> *Principals are involved in ICT group and they are in charge. So he can say that's okay we thought about these kinds of things and he can discuss it and then if you have enough money for that they decide… They support. It's quite well. I think we have a mutual understanding and respect… You have to discuss with them first (F2).*

A principal further pointed out the importance of communication and joint decision making for a better integration of technology and further noted that creating this communicative and collaborative community was in his responsibility.

> *I think it [the role of school management in terms of supporting ICT use in classroom] is economical and motivational. It includes conversation as well. It is very important part of my role. We are setting target together for the future. We have to do it together and share idea and critical opinions (F12).*

In Finland, there was a strategy plan at both school level and city level. These plans were helpful to create a mutual understanding and a basis for what the teachers needed to do. Having a strategy also seemed to contribute to the formation of a shared vision. The presence of a strategic plan and an ICT group at the school were discussed by 15 participants in Finland. The teachers felt supported by the school management due to the existence of related school policies and regular staff meetings.

> *They support us. Because, this is our policy in our school (F13).*
>
> *Of course [the principal values on ICT use in education] because it is one of the three strategies from our school to use ICT use. It is written on the paper… We mainly can teach how to use, and can do basic things, but we can't fix (F4).*

The participants (n=3) claimed that they discuss the formation of a shared vision and strategies in the staff meetings. They would do collaborate with other teachers, and share ideas in ICT meeting every month.

> *We share the knowledge. We have some meetings and conferences in order to change ideas and network with eachother and we have some classes for the teachers… Our principal arranges these meetings and also we have small groups who think about these kinds of things ...we have those group meetings and then we decide what to do (F15).*

The ICT coordinator at the city board, as well as a principal, further gave more details about creation of a city strategy plan. The plan was not only for a spesific school, but it was for all of schools in Joensuu. It was uploaded to Joensuu city internet page. Even though it was mainly written by ICT coordinator, it had been going through all the schools, all the principals and a lot of people who had contributed to building of that strategy. It was written only for 3 to 5 year period.

In Finland, while the city strategy was set by a city association, the school strategy plan was built by a group of teachers. If it was a training school, their strategy needed to align with the strategy plan of an affiliated university instead of the city strategy plan. The city association consisted of educators from different grades. The group in the school was formed by the teachers assigned by the principal. The group was composed of ICT teachers and other teachers who were interested in ICT use and teaching. There were not only strategy plans but also variety of teacher groups and support among the groups.

> *We, teacher training schools, have our own ICT strategy... Every single training school have their own strategy as well… It is on our web site… We have a vision over here, we have something about the networks, having enough equipment… There is something about technical and pedagogical support… We have a chapter about extra training and courses for our teachers… Our ICT group, our future classroom group prepare this strategy plan (F13).*

> *We have city plan, and we have this website in which there are works. Everything that should be known in each school level. It is shortly about some skills that should be thought by theachers like students should know how to open a document or save the document something like that… In the website skills are clearly described… These are not written in the current curriculum (F18).*

S. Korea

In total 14 of S. Korean participants contributed to the formation of this theme. A few of the them (n=2) pointed out the existence of decision making process of the school staff together, while only one participant stated that providing a shared vision was in the responsibility of the principals. Another principal explained his role as maintaining the quality of devices, and supporting teachers' group at school. He further noted that:

> *I [the principal] try to maintain the quality of devices in school and I support teachers' group (K14).*

Moreover, two divergent discourses emerged from S. Korean data: Lack of vision, and a vision that was limited to individuals. In general, there was not a common and predetermined vision or strategic plan in the S. Korean schools, however individuals were able to built their own vision and implement it somehow. Following statements of the S. Korean partcipants (n=7) were the evidence for the lack of a shared vision and a strategy:

> *My school does not have a particular policy regarding ICT use. It's completely optional for each teacher (K18).*

> *I definitely have my own personal vision, but I don't think there is one for the school (K2).*

> *In S. Korea, it is very rare to have a vision about ICT education in a middle school (K6).*

Although, there was no written vision or a strategic plan in the S. Korean schools, they were trying to achieve ICT integration by implementing projects or supporting ideas coming from teachers and students. A common vision for the ICT use was not followed in S. Korean schools. The ideas that schools adopted as vision differed among each school. For example, one principal wanted to improve the virtual education system at his school, while the focus of other principal was the ICT education itself and having evenly distributed computer class hours. With the visionary personalities and the build up of a common vision, the principals seemed to be the determinant factors in the school's technology integration.

> *As a strategy I [as a principal I support] S/W utilization such as PowerPoint, Photoshop, Excel, Flash, Web, Word processor in the school (K12)*

> *The school vision is building a virtual educational system with schools abroad, and using e-textbooks (K7).*

> *School tries to implement ICT education in the school curriculum. So every class has a chance to visit computer lab once a week (K13).*

Turkey

In Turkey, different opinions related to existing vision and strategies arised during the interviews in connection with the ongoing implementation of FATIH project. Because, whether or not the school was involved in this project was changing the participants' school environment in terms of technology accessibility. 16 Turkish participants contributed to the formation of this theme. Two of the participants discussed the importance of having a vision as the school administration regarding the technology integration. They also further noted that having a vision depended on that whether the administration was disposed to realize the technology integration properly or not.

> *There is no vision, not a mission, and neither even a plan… Things are just happening spontaneously. I think this is something about management and primary environmental conditions. There is a great shortage of material in this school. I have also worked in a school with good conditions. If there is an administrator or a teacher who does not have an understanding of a vision, it will not matter even if you have the best infrastructure as well. This does not really help. Technology is not employed very actively in primary schools, I do not know why. The importance of ICT is not yet understood (T17).*

Even if, there were a few comments related to the importance of having a vision and a goal set by the school management, 11 out of the 16 participants clearly stated that there was not a tangible vision adopted or strategy employed in their school. One of the participants who mentioned the absence of a vision, expressed his belief that with the implementation of the FATIH project, they would have a vision accordingly. Two of them pointed out that they do not have a certain vision or strategy, and it's something up to the teacher himself. Interestingly one of the computer teacher mentioned that even a computer teacher did not strive for the formation of a strategy or vision regarding technology use in the classroom:

> *I do not believe we have any policy on [integration of ICT]. We don't have anything resembling a strategy or a vision. We, as the computer teachers, are two people in the school. One of us is working as a formatter teacher and the other is working as a normal computer teacher. We have not made any attempt regarding that either (T11).*

While one participant mentioned that there was neither a strategy nor a long-term plan for technology integration at ministry, at the school level or at a personal level, the other participant pointed out that they just do what the ministry wants instead of adopting a vision. One of the participants suggested that the lack of strategy was because the school administration did not have any concern about technology integration in education issues. He also stressed that principals often attached importance to the development of the school's physical conditions firstly.

I can say that school administrations do not like to interfere with it too much. There is no policy determined. It is more like the students' and the teachers' using these technological devices in schools just as the Ministry suggests them to do ... As far as I am concerned, school administrators do not have such plans ... School administrators are generally more interested in things like preserving the physical structure of the school, environmental cleanup and the safety of the student (T21).

Similarly, a vice-principlal explained that the strategy was defined in general terms at the school. However, these general terms mostly put emphasis the issues consisted of physical conditions of the school and hardware development. Some participants (n=3) further noted that taking an action to support the technology integration was not a planned event but something rather remaining in words and not properly enforced by the authorities or the school administration itself. Previously, two interviewees also put emphasis on having to be spontaneous and unplanned about what to do unfortunately.

We do not have a vision related to technology integration, but in fact, we are arranging that. They have me here. For example, the necessary meetings are held or the in-service training needs of the teachers are examined... However, we, as the school and the administration, didn't make any decision in terms of the development of technology use at the school (T1).

Only 4 of 16 participants claimed that they had a vision or a strategy related to educational use of technology in the school. Once again, it was emphasized that school principals had an integral role in the creation and implementation of these visions and strategies.

There are some strategies, of course. If they did not have a vision, I think they would not mind making us take these courses anyway. Our management really cares about the use of technology. They are open to any kind of positive and constructive activity that will help to bring success (T6).

4.2.1.3.2. Shared ICT Leadership

Second emerging theme was the existence of shared ICT leadership. Shared ICT leadership referred to sharing administrative and managerial responsibilities with other ICT leaders to enhance decision-making process. The ICT leadership was originating from a shared vision on technology integration, which was formed by the support of the school community. This, in turn, was seem to require a view of distributive leadership. In this context, principals did not act alone to implement ideas about ICT use. They needed ICT groups and their support for the implementation. They also needed advice on ICT use and integration from ICT leaders. The inclusion of school community in the decision-making process would also led to the establishment of a common vision as a supporting phenomenon of shared ICT leadership.

In Finland, there was an understanding of shared ICT leadership which was grounded in a shared vision. In S. Korea and Turkey, the participants did not explicitly discuss the issue of shared ICT leadership. While this issue was quite tangible in Finland, there was not much evidence pointing to this issue in S. Korea and Turkey. In Turkey, the participants mentioned that there were the administrators who were still embodied an old school management style. They claimed that this still didn't help much in the process of technology integration. In S. Korea, there was not a distinguishing comment on shared ICT leadership, so it was not reported.

Finland

The idea of a shared ICT leadership was a more distinct, and common practice in Finland. For example, in Finland, the guidance for the teachers was a focal point of the shared ICT leadership at both city and school level. 13 Finnish participants contributed to this category by providing detailed information on shared ICT leadership, and responsibilities of this leadership.

At the city level, there was a coordinator who was responsible for providing guidance to teachers on how to use the technology and how to coordinate and maintain a sufficient infrastructure at the schools. Also another teacher described the role of the ICT coordinator in a similar way. This was mentioned due to importance of verifying the information given. The coordinator explained her role in details as follows:

> *I am coordinator of ICT Education and ICT pedagogy of the whole Joensuu city. I mean I am the coordinator for 20 different schools. I also coordinate the use of ICT in teaching in all these schools. I coordinate the infrastructure, the computers, and iPads when they build wireless networks. Additionally, I coordinate the education of the teachers -how to use the ICT. And I help the teachers do their daily job right. I go to their classes and help them, for example, to have some project with iPads. I also make "this strategy" for the whole Joensuu city schools how they should use the ICT in the education (F5).*

The ICT coordinator also further noted that she was able to get this position due to her interest in the ICT systems and her progressive vision regarding technology use. Interestingly, she also highlighted that her vision did not reflect the vision of other Finnish teachers, and for this reason she was the only one who had to shoulder the responsibilities of the ICT leadership.

At the school level, some schools had an advisor and some others had a group of teachers who were responsible for both professional learning of teachers and technical support. The principal would assign or recruit them considering their skills and willingness to be a part of the group. As a result of this, the principal would share the responsibilities of his leadership. For example, one of the participants, having a role as an ICT development leader at the school talked as follows:

> *I as an audio and visual assistance show how to use technology to teacher. I am also an ICT-development team leader… If the teachers ask for help, our ICT-team helps them… We have these ICT team, we also have subject teams. For example we have science team, and once a month we meet with science team and then discuss about things in the meetings… Sometimes we have teaching for teachers how to use ICT. And we also support help*

> *any time if they ask it…We have some classes and the last few years we try to teach to teachers how to use ICT (F4).*

Moreover, one of the training schools in Savonlinna had an ICT advisor. An ICT advisor was not a staff present in every school. Even if the advisor was employed for this particular school, he was eager to help other schools and teachers in the city. The 3 participants from this particular school explained the responsibilities of an ICT advisor. They pointed out that an advisor mostly provided help and guidance in technical matters. But, he also had a responsibility to help teachers and students acquire skills regarding how to use the programs and applications efficiently.

> *At the moment, we just start to use google apps for education. So, Aleksi - our ICT support desk guides us and helps us to do it in group meetings… Aleksi is more concerned with the technical use of the technology, not its pedagogical use… Aleksi helps us. For example, we have our future classroom file in a website and when Aleksi makes some research, he puts what he finds there. When we need help, we can look if there is something about it in the file - like how to use things (F13).*

Additionally, the ICT advisor was previously worked as an IT engineer in a company. He had experience in only adult education. He defined his role in the school as a person contributing to the creation of a common vision and helping teachers acquire a certain set of skills and helping students better their selves about how to use technology:

> *I am just trying to have one simple and shared line about what we should do. Because when I came here every teacher was using different methods in every class… I am just trying to streamline, so teachers and students can have a similar understanding of how to use same services or apps…I try to give teachers some best practices, inspire them and teach them and try to show them how it would help them and how would it benefit the students (F15).*

Another training school in Joensuu had an ICT advisor, a designer and a teacher who trained other teachers. This teacher helped other teachers in terms of pedagogical use of ICT tools and to deal with basic technical problems. Other two people were taking care of more technical aspects of ICT use at school. In Finnish schools, there were also ICT groups consisting of a few teachers and advisors assigned by the principal.

Teacher groups could consist of teachers from different disciplines. These teachers did not have to be necessarily ICT teachers. Teachers who had the necessary ICT skills, were interested in ICT, and volunteered were involved in this groups. These ICT groups helped teachers with how to use technology in education in addition to solving basic technical problems. Some participants (n=5) gave detailed information on how the groups were created, and what their responsibilities were as follows.

> *I am a member of the group and together we are dealing with all the problems and all the challenges that are coming with technology and we are also giving lectures to teachers. We have a meeting with this future classroom group every month, and we talk about what is going on in the classrooms and what is new, what is going to happen and then if someone found something interesting, new apps, they share with us…We have Kimmo, he is member of the future classroom group. And then we have Jenni from future classroom group and me. We are all classroom teachers. We just help teachers about pedagogical use of ICT. Sometimes some technical issues might come up, but mainly pedagogical (F13).*

In addition to those who were all partners in the ICT leadership, one participant mentioned that the university academicians were involved in this process of guidance as well.

Turkey

In Turkey, there was not a discourse indicating the view of a shared leadership. There was a more authoritarian leadership style due to a centralized educational structure. 4 Turkish participants once again emphasized that the school management's point of view had an important role in determining the school culture. Adoption of a shared leadership style as well as the creation of shared vision seemed to depend on the school management's view itself. For example, an ICT teacher stated that the administration ignored the suggestions of the computer teachers, because not only the administration but also other teachers, students, and parents did not perceive computer lesson as one of the important lessons. Thus, a shared ICT leadership would not even a matter of discussion.

> *The management does not really care about what we say because they do not see the computer lesson as important anymore ... They see the computer lesson as a very empty course from their point of view ... They think that the children are already using the computer better because they are able to use the internet. Everyone (school management, other teachers, students and parents) has such a belief that everyone who uses the internet knows the computer very well (T11).*

A Turkish coordinator, and a former ICT teacher also explained how the mentality of principals affected the technology use of both teachers and students. He claimed that the school administrators may still have an old-fashioned mentality. For example, the responsible teachers or the adiministration sometimes tended to limit the access to the existing technology at the school since they wanted to prevent technologic devices from a break down and wearing off quickly. He also discussed that since the FATIH project had been implemented independently of school policies and management, the technologies had become more accessible, and, this in turn, enabled the use of technology in the educational and teaching environment. A social science teacher provided an example of how the school administration prevented teachers from accessing to the computers.

> *When there is any problem, we come to Ms. Handan, the teacher of information technologies. She handled it while we trying to connect my laptop [to the system]. Because at one point, the former school principal forbade the use of this place (T19).*
>
> ** The library with one computer and projection in it. Teachers used this library when they wanted to give their lessons by employing computers. The former principal forbade its use as a classroom during class hours because it was actually a library, despite the opposition of the teachers.*

A principal stressed that having enough equipment, a responsive school management and the teacher as a role model, respectively, were important for technology integration. He also pointed out that the school administrators were not aware of the importance of using technology in education. In this discussion, cooperation or shared leadership were still not highlighted.

4.2.1.3.3. Professional Learning

Latter emerging category was providing professional learning opportunities for teachers in order to build community capacity. This category was formed by the data coming from 9 Finnish, 5 S. Korean and 7 Turkish participants. In Finland, the administrators seemed to give importance to the self development of the teachers in terms of not only their pedagogical abilities but also the competencies related to technology use. For example, the administrators in Finland were providing financial support and they did not have any difficulty in giving the necessary permits for teachers to take professional learning opportunities.

In S. Korea, even if the participants thought that the school management should provide opportunities for teachers to take various trainings, they claimed that this was not the role of just the school but also the responsibility of other higher level institutions. On the other hand, in Turkey, the participants pointed out that it was difficult to get the necessary permits from the school administration just to attend required trainings as a part of the school community. Furthermore, they also complained that the courses were not very organized and planned either. The participants in Turkey acknowledged that there must be a strong support from the administrators for professional learning issues.

Finland

In Finland, the focus of the argument related to the role of the administrators in professional learning was enabling, and sponsoring the learning process by any means. When the teachers needed to attend a course, the school had to pay for a substitute teacher, and they were supposed to approve a short-term leave permission for the mentioned teacher. Additionally, Finnish administrators seemed more responsive to the teachers' requests. The role of the administrators were explained as being an enabler and a sponsor for the learning by 3 participants. Another 3 participants emphasized the importance of joint decision-making in the professional learning process. Teachers and administrators could decide whether to participate in the courses or not, by discussing the importance, and necessity of them.

> *We have meeting with all the teachers once a period in the semesters, and with science team meetings is once a month, we also have these ICT team once a month. I think main idea of meeting is that deciding how we can develop teachers' skills in our school (F4).*

The participants also mentioned that the administrators in Finland would support and encourage teachers who were keen on and enthusiastic about attending these courses towards educators. The support could mean both providing opportunities, and covering the financial aspect. A principal explained the support he provided as follows:

> *I support the ideas of teachers, and if someone asks me that 'I am very keen on this kind of course, can I take a part?' of course I have to say yes. If I know that he/she is keen on and we need this kind of skills in our school, of course that is a promise. Even if we don't have enough money, we can only try (F16).*

Another 4 participants gave more details about the support they received in their school. Based on the observations and the following quotations, the participants seemed to have very supportive administrators in terms of professional learning of teachers.

> *… The project is funded by the EU. They pay for the expenses like traveling and staying there, but the school has to pay for my substitutes. So the school is nicely supporting the projects I take part in (F2).*

> *We can go to courses if we want to. Last month we went to Jyvaskyla there was an ICT seminar and we got 2 days off from the school. It was okay… The school supported us and paid for the seminar (F4).*

S. Korea

In S. Korea, teachers were taken obligatory trainings provided by MoE annually. Teachers could choose among a variety of courses to fill the compulsory training hours. Apart from these trainings, providing extra courses would depend on the administration and the teachers. In this context, while 2 S. Korean participants pointed out that the role of administrators would be providing more opportunity for professional learning, a principal confirmed that his role was providing variety of courses, and encouraging teachers to participate in them.

> *The role of administrators is to extend chances to take training courses (K8).*

> *I provide opportunities to the teachers to join the teachers' training programs of ICT education...To encourage teachers to use ICT more naturally, I try to offer a variety of training opportunities and encourages them to participate actively in ongoing training (K14).*

On the other hand, other 2 participants, interestingly, highlighted that since the in-service trainings were already provided by the government, there were no further need to provide more by the school itself and these courses had already brought the teachers' skills to a certain level. One also argued that if there was a need for more course opportunities, the required support could be supplied by the MoE.

> *School teachers have the obligation to receive a training once a year. We are undertaking such a task. Since the people are already at a certain competency level, we do not really feel the need for technology related trainings (K5).*

Turkey

In Turkey, in-service training was provided by the state. Additional in-service training could be organized by the administrators at the schools. Some Turkish participants argued that the administration had the role of providing various kinds of trainings at schools, and encouraging teachers to get the trainings. While 7 Turkish participants contributed to the formation of this theme, 3 of them emphasized the importance of the role of school management in providing and supporting professional learning. An example given in this respect was striking:

School management needs to support in-service trainings. For example, there are in-service trainings in the school, but the teachers must be in the classroom at the same time. For this reason, the principal does not approve the in-service training request made by that teacher (T21).

A vice-principal also claimed that since the school administration was not policy makers the impact of them on this process were not much. However, he did not deny that the support of the school administration and the teacher's willingness to learn would help the process of professional learning. 3 Turkish participants including 2 administrators discussed the process of irregular and unplanned training. Teachers seemed to have a problem with the access to the courses rather than having the problem of lack of courses for teachers. This problem seemed to sourcing from late registration requests made by school management, and unplanned training processes.

As the administration, we are trying to provide all kinds of support to our teachers when they ask for it. We have applied for some small activities for outsourced trainings. But it is not something that is developed in a very planned manner (T17).

Some Turkish participants (n=3) stated that the school administration did not approve the teachers' leave for the trainings because the classes wouldn't able to have a substitute teacher. This, in turn, seemed to discourage the teachers to apply for courses.

In-service training of the teacher must be approved. The teacher goes there, develops himself in the matter of technology. But, in the mean time, a substitute teacher can be arranged so that the classes will not be canceled during that week to support him. They do not approve in-service trainings of teachers only for that the course they give in the school does not get canceled (T21).

The reason I do not attend to the trainings given is that the management does not approve it (T11).

A vice-principal criticized himself by saying that he could not devote time to such issues because of his workload. He emphasized that this situation was a shortcoming in improving teacher quality and skill.

4.2.1.4. Permissiveness

This sub-theme, the permissiveness, referred to the discretionary use of technology in a non-directive school environment. In this regard, the discretionary use of technology by teachers was seen as arising from non-repressive or permissive leadership. In the three countries, the administrators seemed not to put pressure on the teachers and the teachers were able to decide whether or not to use technology on their own. However, the provision of this permissive environment realized in different ways and for different reasons among the countries.

In Finland, there was a consultative leadership style rather than an authoritarian one. This leadership style seemed to create a permissive environment, where the teachers could decide whether the technology would be used or not in the process of teaching and learning. Additionally, this leadership style also appeared to support the process of joint decision making. Being able to make joint decisions as a community, in return, eases the implementations of policies during the period of technology integration.

The situation was a little different in S. Korea and Turkey. Similarly, there was no pressure introduced by the school management regarding the use of technology in either of the forenamed countries. However, this absence of pressure was due to different reasons than the ones in Finland. In S. Korea, the use of technology was considered to be at a sufficient level by the teachers, because of that there was not much motive stimulating the use of technology so often and so much anymore. Technology integration was not a focal point as it was in early 2000s. So, they felt that there was no need to put pressure to use technology. A consultative leadership style was not mentioned as a reason creating a pressure free environment regarding the technology use in this case.

In Turkey, the school management was also more supportive of the use of technology rather than putting pressure on the teachers to employ it in the classrooms. But, the guiding and consulting roles of the school administration were not highlighted as a reason of permissive school environment. A consultative leadership style was not also mentioned in connection with the management of Turkish schools visited. Since the lack of repression did not seem to enable more communication and co-operation, the teachers were in opinion of that the administrators did not give much importance to technology integration.

Finland

In Finland, some of the participants claimed that they don't feel pressured by the administrators to use ICT. It was mostly up to the teachers whether they would use it in the teaching and learning process or not. However, they also stated that even if there was not a pressure, the administrators actually expected them to use ICT. The administrators praised the teachers verbally whenever they used technology. They also further noted that since the decision to use technology was made all together, no pressure was required indeed to enforce the technology use in education processes. This kind of non-repressive leadership appeared to originate from their understanding of shared ICT leadership and shared vision.

10 Finnish participants contributed to the formation of this theme. A common view amongst these participants was that there was not a pressure coming from the administrators to use ICT. The administrators did not force teachers to do anything. Because the things that needed to be done were determined based on a consensus. Some of the participants (n=3) including a principal pointed out that jointly-determined decisions eliminated the pressure from the authorities to determine everything on their own. The principal highlighted that his role was not giving orders. He rather preferred to include others to decision making process in order to be a part of the teacher community all together. The principal adopted a consultative leadership style rather than an authoritarian one in the administration of the teachers and the school in general.

The most important thing in my opinion is to be part of that discussion about what should we do and which direction should we go. To be a part of discussion instead of telling what to do. I hate it. To be part of teacher community and have an active role in discussions, I have to make some decisions because I am in charge of using our resources and money, so we have to have some space there for ICT. Of course, I am in contact with Terro about what to do next…. The teachers can just do it. They do not have to ask. I would not ever say no to them (F7).

Other 2 participants from 2 different schools also confirmed that they had a principal who practiced a consultative leadership style as well. Additionally, 3 other participants indicated that the administrators did not tell teachers what to do, but they still expected them to use technology in their lectures somehow. Even so, it was up to the teachers to decide whether or not to use the technology in the classrooms.

The administrators support use of technology just by providing the equipment, nothing else. Well, we have this talk in the autumn that everybody should know this and that but it wasn't said how and when to use it, it depends on me… I think the attitude is positive but it always the matter of how to do things in a classroom. I think they are really happy if we do things with ICT and iPads (F11).

S. Korea

Under this theme, 4 S. Korean participants shared their relative thoughts. These 4 participants agreed that there was no pressure on teachers to use technology in schools. The two participants claimed that there were neither pressure nor guidance to use ICT at the school. One of them also pointed out that they had a permissive athmosphere regarding ICT use.

There is a permissive atmosphere about using ICT in my school (K10)

There is like 0 pressure and 0 guidelines from them. But, even though the fact is like that, I still try to use ICT (K2).

Additionally, S. Korean administrators did not feel the need to put any pressure on the teachers anymore, as they thought that the teachers were already able to use technology sufficiently. One participant explained that there was no passion for using technology often nowadays as there was in the early years of 2000. Because, the technology was already something that was commonly used in daily life now, pressuring teachers to use technology did not even have to be a matter.

> *In the early 2000s, with the release of wireless phones, technology in S. Korea began to develop very quickly. Yes there was such a pressure in the 2000s: there was the idea that we should use the technology and computers much, and we should have a better education, a better life. In the 2000s, we also called the students' families and made an "open class" * event. The passion for the technology was too deep. But this is not the case now, people already see it as a part of education now (K4).*
>
> ** Open class: Teachers call the parents and show them how they give lectures. For these sample lectures, teachers get especially prepared for the event and try to give their lectures with employing the best techniques and equipment available.*

Similarly, a middle school principal felt that he didn’t need to put pressure on the teachers, since the teachers already were able to utilize technology in the teaching and learning process. He also pointed out that now they faced some problems caused by excessive use of technology since it sometimes leads to the distraction of students.

> *I am not sure the teachers are the problem when it comes to ICT use. I think that a lot of teachers already use ICTs, when they teach their subjects. Also, there are many teachers are using their personal notebook, computers and they show some video clips, PowerPoint or Prezi to make their lesson better for their students. So, I do not feel any necessity to pressure/push the teachers use technology or ICT. In same cases, there are some problems, too much ICT or multimedia ideas can make students distracted (K6).*

Turkey

Some of the Turkish participants (n=8) discussed that even if the school management wanted the teachers to use technology, there was no pressure introduced. It was up to the teacher to decide whether or not to use technology in the educational process. According to the 5 participants commented on this issue, the school administration seemed to be more supportive of the use of technology rather than putting pressure on the teachers to use technology in the classrooms. One of them highlighted that not feeling under pressure actually affected her regarding the use the technology, since she would feel petrified and would not know what to do exactly if there was a certain pressure introduced by the school administration.

> *It is not imposed on any teacher that they certainly have to use it (T5).*

> *I never feel the pressure to use technology in my classes. We're not in that position right now. No one is putting any pressure. There's just advice here. I do not know what I would do if there was pressure. Because I'm petrified when there is (T6).*

Another teacher also confirmed that there was no pressure coming from the school management. He also stated that he was not questioned about whether he used technology or not by the authority. He further noted that his reason for using technology was being interested in technology personally and the sense of responsibility he felled towards the students. One of the computer teachers said that even though the administration was not putting any pressure on the teachers, she thought that the teachers needed to be exposed to a domineering force. Because, she claimed that if a teacher had no interest in technology, he would not tend to use it unless there was a certain pressure. In this regard, she as a computer teacher felt responsible for encouraging others to use technology.

Another teacher claimed that because there was neither any pressure nor enough time, the teachers were only interested in doing what they were told to do. They were not trying to improve themselves particularly.

> *We are forced to use the smart boards, so, we just learn to use it, we learn to use whatever is given to us, and we are doing what we can. We can not afford to do something extra for the self-development. Because we are too busy ... School administration leaves us alone. Of course they want teachers to use it [the technology], but there is no forcing it (T5).*

Additionally, an ICT teacher claimed that the lack of pressure from the administrators did not really create a supportive environment. Because there was not much communication and collaboration about this issue.

> *We have the flexibility regarding the use of technology in the class. There is not much pressure by the administration... We do not get in contact with the principal very often. We contact with the vice principal. He says we can ask for what we need. Actually they support it verbally, but there is nothing in practice (T11).*

4.2.2. Participatory Involvement

Participatory involvement referred to the inclusion and collaboration of school administration, teachers, parents, students, academics, or/and city board in the process of technology integration in education. This theme could not be considered totally independent of the categories like shared vision, and shared ICT leadership. Because all these categories and participatory involvement were the reflections of the school culture. These theme emerged as a result of investigating whether teachers collaborate with other teachers as well as other parties in the community such as the school management, parents, students, academicians or city board to enhance the use of ICT in teaching environment. Additionally, how they collaborate and the motive behind their collaboration were also reported.

This theme was slightly different from the community capacity building and its categories, because it was shaped by focusing on community practices, rather than community builders. Thus, community of practice, and informal knowledge exchange were presented as an enabler and a facilitator of knowledge creation and sharing within community members. So that community members become able to learn and develop their ICT competencies more.

Based on observations made in Finnish schools, a strong sense of community was noticed immediately. The communication and support were the main elements in the essence of the school communities. Formal and informal activities related to sharing experiences and knowledge were commonly practiced. However, that kind of practice was not particularly observed in visited S. Korean schools. The S. Korean teachers seemed to be more in favor of privacy and self-taught individuals. They did not get the chance to collaborate formally, since they did not have much time due to a busy schedule comprised of classes and additional duties. As a result of this situation, they were utilizing online platforms rather than face to face meetings in order to exchange knowledge.

In Turkey, the department meetings were the main practice for implicit (tacit) and explicit knowledge exchange. Some participants complained that there was not enough collaboration and knowledge exchange between school members except for the department meetings. It was not possible for ICT teachers to hold any group meetings, because there were usually only one ICT teacher and/or formatter teacher in the schools. In addition, since there was no technology group formed by the participation of other teachers and ICT teacher, ICT teacher had to work alone mostly. Informal knowledge exchange occurred through consulting issues with the ICT teachers, using online platforms for instant messaging and casual talk in the schools in Turkey. Other teachers mostly and casually asked for help from ICT teacher when they needed.

4.2.2.1. Community of Practice

A strong sub-theme that emerged among participants was community of practice. In total 40 participants from three countries commented on this issue: 15 of them was Finnish, 14 of them was S. Korean and 11 of them was Turkish. This theme focused on the involvement and participation of a group of individuals in a practice in the process of technology integration. In Finland, knowledge exchange and sharing between both school staff and community members of other schools took place more than they seemed to happen in S. Korea and Turkey. Finnish authorities and school community members were supportive of group meetings, discussions and the colleague based ICT tutoring. In S. Korea and Turkey, knowledge exchange and sharing were mostly limited to department meetings. In S. Korea, the open-class activity as a common practice became prominent among other activities. In Turkey, monthly held department meetings could be considered as collaboration and knowledge exchange activity examples.

Finland

In Finland, the sense of community and the culture of knowledge sharing seemed to be stronger than other two countries. First of all, the knowledge sharing did not occur only at the individual level but also at the collective level. The existence of knowledge sharing culture fostered the community of practice. Formal knowledge sharing including group meetings, the colleague based ICT tutoring (master/apprentice), and discussion sessions were held to combine and exchange knowledge during the process of technology integration.

9 of the Finnish participants discussed how they did the knowledge management within the community. 3 of them pointed out that they had systematic group meetings aiming to come up with solutions to the problems regarding the use and integration of technology.

> *I am a member of the group and together we are dealing with all the problems and all the challenges that are coming with technology and we are also giving lectures to teachers. We have a meeting with this future classroom group every month, and we talk about what is going on in the classrooms and what is new, what is going to happen and then if someone found something interesting, new apps we share them... (F13)*

Moreover, 5 of them indicated the presence of an organizational learning concept. There was a colleague based ICT tutoring to increase the competencies of the teacher in ICT use. More knowledgeable teachers would teach to others or the teachers who had received the necessary trainings would convey this knowledge to the other teachers throughout both structured and non-structured activities. This knowledge exchange was sometimes not limited to only members of the school community, but to the community members of other schools. Following 2 comments show the practices of colleague based ICT tutoring:

> *Jaana is the one who is responsible for the iPad use. She will help out. But it is not her job to do. She will teach and then if she has time on the breaks or in the afternoon you can go and ask if you have a problem. On Monday morning at 9 she had a little class that everybody can go and she was teaching (F11).*

> *Our working culture has changed… We talked about our lessons before, but it wasn't that much. Nowadays, we talk and share more about our pedagogical views…We talk about ideas, we share the ideas. It is not like lesson or teaching but sharing. I have to say this; last spring I was Apple Professional Development (APD) trainer. I train other teachers in the school… The administrators need to support, but this is such a thing we have chosen together and we are working on it together (F13).*

One of them as an ICT leader (F2) at the school put emphasize on community of practice. He also highlighted that he shared his knowledge about pedagogical use of ICT tools with his colleagues not in a traditional way but in a more interactive way. He said that it was because showing how to use the tools in practice according to the subject of the teacher was more fun than only making a presentation to the teachers. Furthermore, 3 Finnish participants focus on larger community activities for knowledge exchange. They had conferences and meetings at the schools to reach out to bigger communities in order to share ideas and experiences. Additionally, it was possible to cooperate with teachers from other schools. For example, some teachers would be able to participate in a training that would be provided by a teacher with more knowledge on a particular subject from a different school.

> *We share the knowledge. We have some meeting and conferences next week here in eastern Finland. The people from all around Finland come here and change ideas and network with each other and we have some classes for the teachers (F15).*

> *For example, in this school we have so much knowledge that it would be nice to share this also one another. We have thoughts about the courses for this year in a way that's all experts would be able to come and share certain things because some are further down the others and it doesn't*

have to be that I'm here you're here let's share and discuss… The other fifth-grade teachers if they want to use it, they can use it. Maybe they will write a comment. So at least we are sharing, because it is so easy and to plan together also we do that (F2).

The ICT coordinator from Joensuu city board explained that how her government funded the projects created and supported a learning community within the city schools. With the help of this project, ICT teachers of training schools would go and train both teacher and students at the same time, in return, they expected that trained teachers and students would transfer that knowledge to others within the school afterwards. Another Finnish participant pointed out that this idea of training other teachers was brought forward to be implemented in order to extend the collaboration benefits to a wider range rather than being limited to the teachers' collaboration only within the training schools.

Besides having group meetings and conferences as well as formal trainings, teachers had the opportunity to come together to discuss the issues related to the implementation of ICT use in classrooms. As the result of these discussions, some of the participants (n=3) stated that they were able to solve the problems through cooperation and knowledge exchange.

Yesterday we got 5 and 6 grades' teachers together in this place and we are planning how to implement the new strategy into classrooms. It was only an hour and another day we will meet again and discuss a little more and will continue discussing…. Quite often we discuss and tell what I did or somebody else… For example, in physics and chemistry all teachers decided and we now use Google drive (F19).

[The teachers in my school try new ways to enhance teaching-learning activities with the help of ICT], of course, by discussion, when we have them. I just use my imagination and also have my colleague we are working together and it is very good way to think about new ways. We have to have time to discuss (F14).

6 of the Finnish participants emphasized the need to cooperate with the others and share the knowledge and materials that would help the learning and teaching

processes. 3 of them mentioned the importance of encouraging collaboration rather than working alone in the process of ICT integration. This was seen as a necessary step to change the old culture imposing the idea that a teacher must be already knowing all that was necessary to be a competent educator.

> *We try to make them collaborate. It is now a big issue to encourage them in collaborating, because the teachers are quite independent in their work and they got used to be independent person in the class. So, it is a big challenge to make them understood that they can work with another teacher and collaborate instead of just building their own thing….They are bit shy to ask for help, because this is an old tradition that the teacher knows his job. It is time to build more collaboration between the teachers (F5).*

4 of them also highlighted that there must be a cooperative atmosphere created by sharing course materials prepared especially for the same purpose. One of the statements was as follows:

> *The first and main thing is sharing among teachers. Because in towns' school we have very clever teachers but usually they are operating by himself or herself in that class. When we start to operate tablet computers I think that we have so many teacher who are doing same things in our schools. So the main thing is sharing the experiences and materials (F12).*

Another Finnish participant explained why it was easy to cooperate in his school. Interestingly, he pointed out that the teachers already knew each other since university, and for this reason it was not difficult to act as a community for the teachers.

S. Korea

The concept of community of practice didn't seem as strong as it was in Finland. Whilst 6 of the S. Korean participants mentioned that there was collaboration between teachers regarding the knowledge exchange, 7 S. Korean participants agreed that the teachers tended to do their learning and teaching individually rather than collaborating.

A computer teacher emphasized that teachers' collaboration allowed to enhance the use of ICT in the educational environment. He also mentioned that there were teacher communities such as smart learning community, and this communities were helping other teachers about technical issues and devices.

> *I am positive to make teachers' community to help teachers about ICT technic and also to build smart classrooms to provide ICT devices… The teacher work with other teachers to expand the use of ICT in the educational environment. For example there is a smart learning community, they are involved in smart learning training programs (K7).*

The ones who mentioned collaboration of teachers for knowledge exchange pointed out that it was happening with the help of department meetings, open-class observations, and the colleague based ICT tutoring. 5 S. Korean participants underlined that teachers' collaboration and knowledge exchange in the department meetings could be seen as enablers for ICT integration. In the meetings, they shared tips about how to use ICT in the classroom and resource management.

> *We have a teachers meeting every week so that we can make a chance to introduce new tech to the teachers and also we share teaching resources from the web… We discuss how to teach in another teachers meeting consisted of teachers working in the same grade so we can share the contents and tips… Other teachers [are the enablers for integrating ICT into education in my lessons] (K13).*

In S. Korea, the open-class observation was a very important activity for the teachers. Because, on these days, the classes were open to parents, teachers, and administrators. The parents would come and watch their children's class and teacher. Some teachers (n=3) stated that open-class practice was a way of exchanging knowledge. One of the S. Korean participants mentioned that it was also a way of getting different ideas about how to use ICT in the lectures.

> *Teachers acquire class ideas by observing each other's lessons during open class time. In addition, the class materials are shared through the meeting of the same grade teachers. They are working hard to teach*

> *children in various ways and if there is a chance to join a good training program they participate together (K14).*

A teacher from a school that was recently taking part in a future school project stated that in order to increase teachers' ICT skills, she was training other teachers after school hours. 7 S. Korean participants, on the contrary, agreed that there was not much collaboration and knowledge exchange between S. Korean teachers.

> *Teachers do individual learning and participate in training courses in order to develop teaching-learning activities with the help of ICT…Teachers collabrate with each other just a little bit…We cooperate for smart learning school (K9).*

> *There is very few, but most of the time interaction happens among same subject teachers. There are some meetings and cooperative classes. But it is not really popular (K1).*

Additionally, a math teacher explained that S. Korean teachers didn’t want to share or show their classroom practices due to feeling intimidated. He added that they are closed-minded in this sense. Another participant further noted that having a busy teaching schedule wasn’t helping the collaboration of teachers either.

> *I or my school never did that before, like collaborating about education with another subject. But I think we should do some collaborative work. I actually think doing one in sometime. There is a point that S. Korean teachers are closed-minded and intimidated when it comes to opening up the classrooms and stuff (K2).*

Turkey

In Turkey, the knowledge exchange seemed to happen mostly at the monthly meetings of all community members and departments rather than by making a special effort to come together with the intent of sharing knowledge and experience about technology in particular. 8 Turkish participants highlighted that regular department meetings enabled teachers’ knowledge exchange in a way.

Only department meetings are held in schools, where teachers share a range of ideas about class and course management individually. They influence each other one way or another and the good suggestions are taken into consideration and put into practice (T13).

These meetings supported the interaction between the teachers focusing on the same subject groups, however, did not contribute to collaboration of other teachers from different subjects. 3 Turkish participants explained the cooperation was limited to only members of the group.

There is no special assistance for each class individually. But, at such meetings, people are helping each other and providing ideas regarding how they are using it [technology]. In addition, these kinds of topics are already being talked about in the department meetings, we determine some websites with the friends from the department commonly, like saying they are good. We use them commonly ... Every branch [department] has its own way of sharing technology within itself, there is no sharing between departments (T5).

Additionally, 4 Turkish participants stated that there was not enough collaboration and knowledge exchange between school members except the department meetings. One of them even claimed that minimum level of knowledge and material sharing took place between teachers, since it was not a very common practice in Turkey.

Frankly, I felt that our teachers had a lack of co-operation (T10).

I think teachers give each other PowerPoint presentations that they prepared. Or they are already present in addition to some helpful books. They take them and give each other. Or if they have prepared it, they say each other to use it ... But it is not something very common in Turkey as far as I know (T12).

Another participant pointed out that there was not even a department meeting for ICT subject since mostly there was only one ICT teacher in each school. He further emphasized again that only the teachers from the same department would share knowledge with each other.

A vice principal claimed that the department meetings were encouraged with ICT tools as well. For example, MoE recently launched an online platform named “e-Zümre [literally e-Department]” which included date, place, agenda, decisions and results of the actual department meetings.

4.2.2.2. Informal Knowledge Exchange

Informal knowledge exchange referred to informal networks built, and communication among the community members. Under this sub-theme, informal ways of individuals’ mutual exchange of implicit (tacit) and explicit knowledge were reported. In Finland, most of the participants stated that the pedagogical technology use and the issues that may occur in the process were discussed in the coffee/tea breaks. Moreover, they were comfortable to ask their relevant questions to other community members and seek for help anytime. The teacher who was responsible for ICT related issues would help them sometimes. In S. Korea, the participants preferred to join Facebook groups or to the groups formed via some other independent S. Korean community websites for informal knowledge exchange. In Turkey, the teachers seemed to ask help from ICT teacher casually when they had problems. Moreover, they mostly used Facebook and WhatsApp for communication.

Finland

In Finland, informal knowledge exchange was also a common practice. The teacher communities were able to mutually exchange their implicit and explicit knowledge by using technology and online platforms. Moreover, they often tended to chat in the coffee/tea breaks with the intention of knowledge exchange. Another practice they employed was to informally switch classes in order to give the opportunity of knowledge sharing to a teacher who was more competent on a subject with his / her particular skill set.

Majority of Finnish participants (n=16) discussed the way of informal knowledge exchange amongst the teachers. 7 of them strongly indicated that having a chat in the coffee/tea breaks were their way of exchanging knowledge with others.

> *We have an hour meeting in a week. We meet, and plan together; but usually we plan while eating or when we are at upstairs, discussing about things over a cup of coffee. They are not really official (F10).*

In particular, 3 of them pointed out that their working culture had changed: Teacher and students had more casual interaction in order to share experience and knowledge.

> *Our working culture has changed. So, at lunch, in cafe we talk about what we have done. For example, they ask what i have done, they share their experiences, they say this didn't work, and can you help me I don't know what to do. I started with iPad, and then our students invented "okay you can do this and please look what I have done". Teachers and students are all sharing their experiences (F13).*

7 Finnish participants stated that the teachers were able tp consult with other teachers at any time. Teachers mostly would consult or collaborate with a responsible teacher acting as ICT leader in the school. These talks and discussions wouldn't be done in a planned or structured manner.

> *She will teach and then if she has time on the breaks or in the afternoon you can go and ask if you have a problem… Of course we talk during the breaks and if we have done something we might tell the others who are interested that we have done this and that… It is quite informal, Jaana is usually the one who is required to do something about it (F11).*

A principal mentioned that face to face conversations were very important for sharing and collaboration. However, he didn't ignore the importance of online platforms too.

6 Finnish participants highlighted that the technology enabled the knowledge sharing. They pointed out that they benefited from social media, cloud technology and a game-based learning platform for knowledge exchange. Facebook seemed to be the most popular social media platform among Finnish participants for informal knowledge exchange.

> *Some of the teachers have blog, I don't have. But mostly it is not very official. When we have free time we discuss how to use, how they work, and exchange the ideas… Sometimes with other schools we collaborate via the Facebook groups etc. to know what is going on (F4).*

Dropbox, box.com, Google Drive were the cloud platforms that were also used in the schools for collaboration. Moreover, the teachers shared their materials via an online platform called "Kahoot". Another unique and informal way that Finnish teachers benefited from were switching classes or doing joint classes together. When teachers switched the classes, students were able to learn from a different teacher who had an advanced level of competency in a particular subject. In this context, the teachers could also learn from the students. Doing a joint class was a rare practice though.

> *Sometimes teachers can switch their students with the same grade students. If a teacher is very keen on ICT, he/she can teach it to the other class. Many teachers in our school they collaborate with each other (K16).*

> *Quite often the teachers by themselves organize the course by exchanging classes like ICT with music or vice versa. Freely they can change classes with each other and find the best skills they have. It is not formal actually. Some teachers are good at skiing but others are not, so they change courses among each other (F7).*

S. Korea

In S. Korea, only 4 of the participants mentioned technology enabled knowledge sharing. The other S. Korean participants didn't indicate any other way of informal knowledge exchange. It was interesting that even if there was an online platform that included exam scores, and background information of students, comments and thoughts of teachers about the students, a chat/sharing platform amongst teachers and parents provided by MoE, none of the S. Korean participants said that it was used as a tool to share/exchange knowledge.

One of the S. Korean participants pointed out that they had a community group on Facebook. It was in S. Korean and open to other educators. They were sharing their knowledge and example of their classes on the group. 2 S. Korean participants further noted that each class in the school mostly ran a blog or had a Facebook page as a platform at which the students, teachers and parents could engage and collaborate. Additionally, the S. Korean teachers were using independent S. Korean websites in order to exchange knowledge and share course materials. For example, one of the platforms was called "Indischool" (https://www.indischool.com/). Teachers were participating in this kind of community websites as a member by paying out of their own pockets in order to reach a massive database and an abundance of course materials.

> *When we look at it in terms of teachers, there is a website that teachers use. Through this website, for example, we try to notify each other by sharing knowledge when a new technology, a program or project is released.... This website is not a reflection of any country policy, it is a platform created by teachers own effort. We pay the fees out of our own pocket. After all, the website owns a large database. This website is also used by the departments and is generally used for informational purposes (K4).*

Turkey

10 Turkish participants commented on this issue. According to these participants, informal knowledge exchange occurred through consulting issues with the computer teachers, using online platforms for instant messaging and casual talk in the schools in Turkey.

6 of them stated that they mostly asked help from ICT teacher when they needed. If there was not a computer teacher in the school, a teacher who had interest in ICT use and knowledge about the issue would help other teachers. The ICT teacher would check availability of applications, videos or other multimedia materials and share them with the others.

> *Teachers who have experience and knowledge about the installation and use of ICT tools help other teachers (T16).*

> *The teachers who want to cooperate are especially contacting me [a computer teacher] or they want to use the computer lab when it is available. They are trying to find the appropriate program [application] or I'm trying to help them to find it, they are asking me for audio records, videos. I help them as much as I can (T20).*

In Turkey, some Turkish participants (n=3) stated that the teachers were using chat platforms for instant communication. Facebook messenger and WhatsApp groups were commonly used ones. 2 of the participants specifically draw attention to casual knowledge exchange. When they were together, they claimed that they talked about new applications, new systems or pedagogical use of technology.

> *We do not have a common Facebook group, it is more like on a personal level. We are dealing with our problems face to face with our teachers in school ... What teachers talk about when they come together is either about the students or how to do the classes, or new systems etc. Or, for example, it can be a different thing that is being practiced in another school or something applied by another teacher, that's it (T1).*

One of the Turkish participants explained that teachers wouldn't be able to reach some online platforms in the schools due to restrictions on the internet enforced by MoE. However he also highlighted that after school hours, teachers used Facebook for sharing their course materials.

> *It is not possible to have Facebook as a platform for teachers to use at schools, because MoE limits Facebook access here. Maybe not at the school, but at the outside of school, some of our teachers are able to share their written questions in a group they set up on Facebook together with their answers after exams. We have teachers who do it like that. One of our teachers established his own group like that, and the students are able to submit their homework through this group. Teachers already communicate with each other because of their Facebook friendship. Usually, there is not an official thing, that is, they are developing their communication only by talking to each other (T21).*

Since, there was generally only a single computer teacher in Turkish schools, computer teachers didn't have a department group or meetings as the other subject teachers had. This was mentioned under the theme -Community of practice. In this context, a computer teacher stated that they had an independent website for computer teachers used across the country.

4.2.3. Teacher Development

Teachers were the focal point of this study. The teacher development referred to the process that supported teachers to develop their own methods and expand their pedagogical knowledge regarding technology use in the classroom. Under this theme, teachers' knowledge and skills and also their professional development levels regarding ICT use were discussed as the sub-themes and training content as a category was reported under the professional development sub-theme to mention the scope of teachers' training courses. In the identification process of enablers and barriers for the ICT use in education according to the statements of the participants, the focus on teachers' development issue was too distinct to be ignored. For example, the following examples of the participants' quotes could provide clues about the role of teacher knowledge and skills in the technology integration:

> *The enablers for integrating technology into the classroom are the infrastructure, the funding, all the machines and the attitudes of the school, children and teachers. But the integration extremely depends on the teachers' knowledge and skills in educational technology use (F2).*

> *Lack of technology, poor facility, and teachers' individual competence to use tools are the barriers for the integration (K9).*

> *I do not think there is a barrier for technology, the technology has advanced enough, the internet is available everywhere, the hardware is sufficiently developed, I think the only obstacle is the human intelligence itself, limited imagination and lack of motivation (T21).*

4.2.3.1. Teacher Knowledge & Skills

Teacher knowledge and skills referred to the required abilities and knowledge level regarding the use of technology. This sub-theme provided a perspective on education of teachers and how important that was. It was explained including current level of teachers' knowledge and skills to use ICT in their classrooms. At least half of the participants from each one of the countries agreed that education of teachers played a major role in the acquisition of required abilities to use technology. But that did not really mean that ICT related trainings were given at certain level at the universities. In Finland this situation varied based on university and people involved in the related environment. The lack of know-how transfer was emphasized.

In S. Korea, the participants thought that teachers' education was able to provide opportunities and necessary experience for teacher candidates. It was emphasized that technology was frequently used in everyday life by the teachers and the teacher candidates. But, it was also said that their skills may not go beyond the point of making a presentation on PowerPoint.

In Turkey, the lack of education on pedagogical use of technology was emphasized by the participants. The government was developing technology-oriented policies such as the FATIH project, but some participants expressed the belief that experienced and newly graduated teachers didn't really have the required knowledge and set of skills to use technology offered by the project efficiently. So they thought the newly graduated teachers were not equipped with the necessary set of skills during their studying.

Finland

In Finland, the participants agreed that the teachers were one of the key points for enabling ICT integration in the classrooms. Their education and their competencies would define their ICT use in the learning and teaching process. For example, a participant stated that knowing how to use a technology would help a teacher to make the best of that technology regarding its educational use. 7 of Finnish participants believed that the teachers had to have certain set of skills to use technology in the class. Lack of teacher knowledge and competency were regarded as a barrier against technology integration.

The teachers and their education would be a good place to start with for enabling ICT integration… Teachers need to be more educated (F11).

I think the biggest barrier is the teacher: If they don't know how to use it or have a fear about working with them, they won't use them. So that is the main point to start; to lower their fear for ICT and try to make their skills better. When they have the knowledge, and they know how to use it, they won't have a fear and they will use it in the classroom (F15).

4 Finnish participant claim that the teachers' education was not providing sufficient knowledge and know-how in terms of supporting teachers' ICT use in education. They put emphasis on that only insufficient number of classes about how to use ICT in their subjects was given to the teacher candidates during their eduction. Other than that, they acknowledged the quality of their teacher and teachers' education.

I think [the teacher education in my country] is poor in terms of supporting teacher ICT use in education. They try their best, but teacher candidates don't put enough effort for it. Their ICT use is reading e-mails on iPads, that is not the use of ICT in education…I can say that they give wonderful education to the teachers. We get very good teachers from the university. There is only one lack; they haven't got enough education using ICT. Otherwise, they are brilliant and nice, just perfect teachers (F5).

The teacher education in my country varies a lot in terms of supporting teacher ICT use in education… But we have a great one [a professor] in our city. But still it varies. I guess it depends on city, and person…. Also, some don't have enough money to have these equipment in the university (F13).

However, one of the participants pointed out that, the number of classes related to how to use ICT in relation with a subject was insufficient at the times when they studied at university. He said that it had been changed now: There are more classes provided at the universities and there are policies supporting ICT integration.

3 Finnish participants indicated the importance of school experience and teaching practice for the teacher candidates. One of them put emphasis on the importance of granting teachers with "know-how" at least during their education, while the other one

pointed out the necessity for the improvement of role model teachers' ICT skills in training schools in order to provide a broader experience to the teacher candidates.

> *We should be able to at least open the teacher trainees' eyes to the possibilities that the technology can be used in schools… Well this is a big problem, because the teacher education, teacher training schools and departments of teacher education should have that at least "know-how", they should have the funds and the ideas. In teacher training schools, they mostly get their practices… But what is compulsory for all doesn't give you a very good know-how in the use of ICT (F2).*

Lastly, an ICT advisor as well as a teacher pointed out that the teachers themselves were the key factor in order to improve their ICT knowledge and skills. She explained that teachers should keep an open mind and be open to change and new ideas:

> *The role of the teachers is huge. The willingness changes it. You need to be prepared to the change. We need to be positive and open minded to the change and learn to live with the continuous change; that is the most important thing. We should accept that these things will change. If I go to the teacher training and learn the skills, after 2 years it will be the old skills and I will need to learn new skills. That is how the life is now (F5).*

S. Korea

As it was mentioned by the Finnish participants above, some S. Korean participants (n=4) also acknowledged that teachers' skills and knowledge of how to use technology properly for educational purposes would help technology integration in the classrooms.

> *They should have abilities and skills to modify the original materials for educational effectiveness (K10).*

> *First of all, teachers should know what kind of abilities are need for using technology and how they can use this technology in the classroom (pedagogy). I mean, I think they have to know really good points of them. This is first step for integrating technology (K2).*

2 S. Korean participants complained that the lack of ICT knowledge and skills undermined the technology integration. One of them also pointed out that little was known about ICT education amongst the teachers.

> *New generations know very well about technology and techniques and stuff but they don't relate it to education…The perception of ICT education is that it is not well-known among the teachers (K2).*

4 S. Korean participants explained teachers' education in S. Korea. They thought that teachers' education in S. Korea provided opportunities and necessary experiences for teacher candidates.

> *S. Korean teacher education receives training and provides an atmosphere where teachers can communicate with each other in the teachers' clubs in the school and allow them to improve themselves (K15).*

> *Online ICT courses were provided at the university level so that the teacher candidates got familiar with ICT use this way (K4).*

Other 4 S. Korean participants provided an insight related to how the teachers' skills of ICT use were assessed and ensured by the school and government. Interestingly, the ICT use of the teachers referred to only a PowerPoint literacy by 2 participants. The level of teachers' ICT use was ensured by having them make a demonstration lesson about how to use PowerPoint and they were also asked for an ICT certification in order to be promoted. However, one of the participants stated that the certifications wouldn't be considered as a requirement of ICT knowledge indication after the year 2017, since each teacher would be assumed to already have the necessary knowledge by that year.

> *In the teacher employment examination, PowerPoint literacy is assessed, most teachers have a good use of ICT (K17).*

> *In S. Korea, you must have an ICT certificate to be promoted to the next level [as school member] up to 2017. This is reflected in your score and as your score increases, your rank changes. However this practice will be removed after 2017. Because everyone will be accepted to know it already (K4).*

Turkey

13 Turkish participants put emphasis on the importance of teacher knowledge and skills regarding both pedagogical use of technology and the use of technology itself in general. 5 Turkish participants pointed out that teachers needed to know relevant knowledge and have ICT skills so that they could use ICTs effectively in the process of teaching and learning.

> *The more effective the teacher uses the technology, the better the child will understand, but if the teacher can not use the technology substantially, it will be reflected negatively to the children. In order for the students to understand better, the teacher has to be competent and sufficient in terms of technology. When the teacher is not able to use it effectively, the class just passes so quickly while he / she is trying to figure out how to use the technology. The children can not understand anything and get just bored (T20).*

> *The role of the teacher is very crucial. They have to improve theirselves. They should be able to use the software and the smart board. For this, they must have a basic computer knowledge (T8).*

They also expressed the belief that when newly graduated teachers started working at school, they should be well equipped with the knowledge and skills that allows them to use technology in their classrooms easily. 5 Turkish participants pointed out that importance should be given to the use of technology in universities so that newly graduated teachers could use it in schools when they became the educators themselves. In this way, they would not have any difficulty in integrating technology into teaching and learning processes and would be able to help the students more in that sense.

> *I believe that the use of ICT should be supported in university education. I did not receive this training personally, but after starting my career I tried to make up for these shortcomings (T16).*

> *I think teachers should already have the required knowledge after university. I think we should not be facing the students with little technological knowledge. The students know much better than we do, because they are constantly in touch with it and they are trying and learning it (T10).*

Especially 4 Turkish participants emphasized the necessity for the availability of the courses related to the pedagogical use of technology. Because, they thought that it just was not enough to be able to use the technology itself, it was more important to know how to use them in their own classes as educators.

> *Teacher candidates make project presentations, it is no big deal, I can do it too. But can we really say that making presentations from PowerPoint is what using technology means? Maybe a little. More advanced knowledge of technology such as preparing a game, opening a blog should be given. Because the time is moving, we should not fall behind the time. There must be specialized teachers for this. For example, I know a technology teacher, and he is not so good at technology. He must be both a methodist and a technologist so he will know how to use it (T6).*

Some interviewees argued that teachers didn't have much knowledge and skills of how to use ICT when they graduated from university, while others thought that newly graduated teachers had better knowledge compared to much former graduates. However, this may be explained by the limited access that the former graduates have to computers in everyday life based on contradictory statements. Additionally, one computer teacher explained why the training of computer teachers were not so good in Turkey:

> *There is a really big difference between the education we have received and the education we give. As you did not receive a very good education, it is up to you to make up for the rest and go beyond it since they are giving education only in certain subjects at the university. Due to the increase in the number of universities, our education quality has quite reduced, we are graduating without learning a lot of things (T11).*

Some Turkish participants mentioned that if it was aimed to increase and spread the use of technology by applying new policies into education system, teachers' training faculties should have also acted in line with this objective. They argued that teacher candidates needed to graduate with required knowledge and set of skills to deal with different types of technologies. For example, they claimed that newly graduate teachers had to know how to use technologies that FATIH project offered, but this was not the exact case in Turkey.

For teacher candidates' to be supported in terms of technology use in education is absolutely necessary. Especially if we take the scope of the current Fatih Project at university level, teachers should definitely receive trainings about EBA use, smart board use, and tablet use. In addition to these, trainings such as video editing, presentation preparation, audio editing, image editing should be given in order to enable them to prepare educational content, these are missing in universities (T21).

If you will integrate a certain technology, you will either change the teachers or raise them from scratch. They need to be trained, this is what I see as the biggest problem (T4).

4.2.3.2. Professional Development

Professional development referred to the activities that develop and improve a teachers' skills, knowledge, and expertise. This sub-theme was emerged from participants' statements related to the current situation of teachers' professional development. Providers of professional development activities varied among the countries. The courses were not compulsory in any of the countries involved in interviews. Teachers had a choice, and they were able to request for professional development courses and also they were able to attend any of the courses offered.

In Finland, professional development activities were provided by The Regional State Administrative Agencies (AVI), city board, academics / university, private companies, school administrations and experienced teachers. Preparing ICT-related projects, providing corresponding trainings to support the teachers based on the objectives of the project, and meeting the expenses from the project budget were common practices in Finland. In addition to that, conferences and meetings associated with the projects were another ways of contributing to teachers' ICT knowledge and skills. Emerging requirements on individual and/or collective level would determine the scope of trainings to be provided including in-service trainings. ICT related professional development was mostly supported by teachers with ICT education background or teachers with better ICT capabilities in the school enviroment.

In Finland, academicians, ICT coordinators, and teachers would collaborate to provide more training opportunities for all the teachers in the Joensuu city. Teacher training schools had more support and opportunities in terms of professional development of the teachers and collaborative work. In addition, all of the courses given in the city was kept open to the attendance of all teachers in the city. This practice was specific to this city and was not shaped by a decision from the state level. Although, efforts for enhancing the professional development of teachers in order to improve their ICT skills were observed, some problems regarding the level, consistency, structure and content of the courses available to teachers were detected: The short-term courses were inadequate, some trainings were not accessible due to being held in a distant city and shortage of budget, lack of advanced level ICT courses.

In S. Korea, professional development courses were provided by Seoul Metropolitan Office of Education (MOE), Provincial Office of Education (POE), Seoul Education Training Institute, On-line training institute, and teachers' community. Additionally, some private companies such as Samsung and Microsoft would also provide trainings within the scope of some projects in line with government's ICT policies. A lot of online and other types of courses for teachers were available too. The government had commercial cooperation with some private companies generating various development programs and contents in line with the requests and needs of teachers. The courses were provided for free. Online courses were favored against others.

The participants expressed the belief that teachers were capable of managing their self development. The ICT related courses were not compulsory anymore, but if teachers were interested in learning more, they were welcomed to take additional courses. Everyone was now thought to have ICT competency, because the technology was already being used as a part of the daily life by everyone.

In Turkey, in-service trainings were provided by Turkish Ministry of Education (MoE) throughout a year. In-service trainings were seen very important for the improvement of teachers' ICT skills. The focus on participating in projects along with conferences for professional development was not a highlighted approach as much as it was for the Finnish participants. Some participants claimed that FATIH project encouraged them to take courses regarding ICT since the required tools were already available in the classroom with the help of project. However, some teachers were not satisfied with the level and content of the courses available to teachers. They were either too easy for them or useless for real-life practices.

If the courses were not compulsory, teachers would not want to participate. Some thought there was no reason to advance their skills, since the curriculum didn’t require an advanced level of teaching skills with the technology. Some others believed that they knew enough so they didn’t feel the necessity of attending any courses. Additionally, some were too busy in their personal life, so they didn’t want to devote extra time to courses.

Finland

In total, 19 Finnish participant commented on their professional development process and related courses available. Various providers offered support for the professional development (PD) of teachers in Finland. The providers were including The Regional State Administrative Agencies (AVI), city board, academics / university, private companies, school administrations and experienced teachers. Additionally, conferences, annual meetings, and projects were helping teachers to improve their ICT knowledge and skills. If there were ICT related projects in which schools were involved, expenses for some of the trainings were covered within the budgets allocated for these projects. In Finland, it was a common practice to prepare ICT-related projects, provide the corresponding and supporting trainings for the teachers based on the objectives of the project, and meet the expenses from the project budget. For instance, 7 Finnish participants commented on how the projects helped their ICT related professional development. 2 of their statements were as follows:

We had to educate teachers for 'Future Classroom Project'. Other specialized people (academicians or some teachers from other schools) who used it before assisted our teachers. They were coming here to tell us what is going on and teach how to use them and after then we were educated to use some apps and programs (F12).

We also have trainings within the country all the training schools. We have a lot of development programs. We enhance the use of ICT and we have meetings 3 or 4 times a year, of course this also costs something. But we have some project money that we can use to pay for our expenses, but again the school pays for when I am absent for teaching when somebody is taking care of my class… I have a project where we are putting technology into sports (F2).

Conferences and meetings were another way of improving teachers' ICT knowledge and skills in Finland. These conferences and meetings were mostly associated with the project involvement of teachers. The trainings and courses were generally offered to satisfy a need. If there was a new program that needed to be used in the school, the teachers would get trainings about how to use this new program. The trainings and courses were also provided according to teachers' individual needs and requests.

Trainings based on teachers need. They ask me to bring somebody who can teach them what they want to learn (F9).

If they ask something we help them, if we have new program we teach them or organize other people to teach them (F6).

Most of the time, the teachers were responsible of their own trainings, and the course choices. That was because participation in the courses was generally voluntary. Academics were also involved in the process of teachers' ICT related professional development in Finland. There was a collaboration between schools and universities. This collaboration was project based too.

Most of the Finnish participants (n=12) pointed out that their ICT related professional development was mostly supported by teachers with ICT education background or teachers with better ICT capabilities in the school environment. This finding was reported under Community of Practice as a part of formal knowledge sharing. But, under this sub-theme, these 12 participants explained how other teachers contributed to their professional development process. For example, participant F3, and F7 explained that some teachers were responsible for providing in service trainings for the other teachers at the schools. These teachers were mostly interested in technology use. If it was necessary, administrators would invite teachers from other schools who were capable of teaching ICT skills. One of the participants also mentioned that they got help from teacher trainees in terms of providing training for teachers in the training school.

4 Finnish teachers who trained other teachers in training schools and other schools explained that they offered ICT trainings as much as they can. They emphasized that trainings were not given in the form of too many variations or very long courses. The main purpose of trainings given at the schools was teaching basic ICT skills.

> *We don't have an ICT teacher. Sometimes we organize trainings. Jukka and I were there to show how to use technology. We tell theachers how the technology works and teach basic things. Teachers who take part in these ICT courses can understand how to work with them. But, some teachers didn't come. If some teachers have some problem they can ask me, and if I know I go to classroom and show them (F6).*

Being the only teacher providing ICT trainings at the school, one of the participants pointed out that having only one teacher that was responsible of training the other teachers was not sufficient at all. F19 stated that it would be much better if there were other teachers to provide trainings and maybe one teacher who was responsible for the trainings full time. A classroom teacher (F2) with the ICT education background from one of the teacher training schools explained how they collaborated with the ICT coordinator at the city board (F5) to provide more training opportunities for all the teachers in the Joensuu city. All of the courses in the city could be open to all teachers in the city. This practice was only an exception to this city and was not shaped by a decision from the state level.

Teacher training schools seemed to have more support and opportunities in terms of professional development of the teachers. They had teachers with ICT background, ICT guiding groups, teacher trainees having ICT as their main subject. Additionally, the government would provide more money and allocate more resources since they had to train teacher trainees. In this context, teacher training schools were able to designate money for professional development courses and private tutors for their own teachers. 4 participants from Joensuu and Savonlinna teacher training schools explained the concept. One of their statements was as follows:

> *We have some kind of educational system for the Finland's teacher training schools. We got money for that. It is operated by our network system. We have some money to educate our teachers (F12).*

Although, efforts for enhancing the professional development of teachers' ICT skills were observed, some problems regarding the level, consistency, structure and content of the courses available to teachers were identified. For instance, 7 Finnish participants expressed the belief that the short-term courses were inadequate. The short-term courses were not enough to acquire necessary set of skills, and really learn how to use them effectively. One of the participant (F6) claimed that after some 2 hours course, he still didn't know how to use the new program. Even though he was not yet able to learn how to use the program, he was expected to teach the other teachers.

> *Now, mostly I give those 1 day courses by myself, but we are building different, new kind of education for the teachers. For our teachers most of the courses are short, they are 1 day long and they focus on some special issue or skills. Joensuu city arranges those one day courses to the teachers… Some teachers get enough in one day and they can change some small things, then there are those teachers whose skills are very small they would really need longer duration of the courses (F5).*

Another issue regarding professional development related trainings was their accessibility. Teachers had to travel to the bigger cities to attend the courses. The time they spent for taking these courses and travel were not counted as working hours. 3

teachers indicated that traveling to another city and spending their free time for this purpose were not appreciated by them.

> *There are a lot of courses that people can go in Helsinki, but from Joensuu you have to travel like far away to get there and you have to train during the work hours, you have to do your free time or weekends (F8).*

Only one participant who was an ICT coordinator and a teacher in a high school stated that there was not advanced level ICT courses available that she could take.

S. Korea

In total, 15 S. Korean participant commented on their professional development process. In S. Korea, Seoul Metropolitan Office of Education (MOE), Provincial Office of Education (POE), Seoul Education Training Institute, On-line training institute, and teachers' community were providing professional development courses. Some private companies such as Samsung and Microsoft also provided trainings for the teachers within the scope of some projects in line with government's ICT policies. 5 S. Korean participants commented on the providers of professional training courses.

> *MoE has pushed ahead with a variety of projects including the advancement of teacher's skills of information utilization such as education of ICT knowledge by providing customized training programs. There are many collective and remote teacher training courses available. Teachers' competency of ICT use is increasingly required as educational circumstances rapidly change to an ultimate level and the learning quality in classrooms increases. The support for the students' self-directed learning is mostly required. Most teachers make an effort to utilize ICT for teaching students effectively (K10).*

One of them pointed out that teachers' university education gave enough support in terms of improving their ICT skills. Variety of professional development courses were also provided when they started working. Many participants (n=8) said that a lot of online and other types of courses for teachers were available. Some of them stated that they preferred to take courses online. One of them highlighted that the government had commercial cooperation with some private companies generating various programs and contents in line with the requests and needs of teachers. The courses were provided for free to the teachers. Some of them also stated that teachers could learn and improve their skills on their own. One of them claimed that teachers did their own research to find a professional development course.

> *Teachers learn how to use themselves or from online courses or other teachers. Some teachers take courses but in this school, the teachers including me don't. Learning technology does not take long time. (K3)*

Half of the S. Korean participants (n=10) indicated that the technology was already being used naturally by everyone. Therefore the ICT related courses were not compulsory anymore, but if teachers were interested in learning more, they were welcomed to take additional courses and learn more. ICT skills certification that were previously compulsory was no longer something mandatory, since everyone was considered to have these skills already. If teachers were interested in taken courses, they were able to do it. Following statements provided insight regarding teachers having free will to take ICT related courses:

> *Nobody particularly teaches to teachers at the school. Teachers learn voluntarily by taking various training courses (K12).*

> *There is nothing officially provided. However, it is quite natural in S. Korean daily life to access to media and friends via smart phones (K11).*

Two participants explained why the 60 hours of in-service training, which should be taken during an academic year, was not necessarily related to ICT skills. Previously mandatory certificates for ICT qualification was not required anymore by the government. Everyone was now thought to have enough ICT competence.

> *The content of the annual 60-hour training is about the individual's own preference. I, for example, have received trainings related to the implementation of intelligent education and ICT. Apart from that, some people can be taking trainings regarding the use Office Word or MS Office. Also, it is not valid now, but previously, our trainings were being reflected to our scores ... In S. Korea, people's interest, tendency, and ability to use technology are vast and has already reached a certain level.*

For this reason, it is not very important that there is a policy or not regarding that in the country. People are very conscious about this and they are able to use many machines (K5).

Turkey

In Turkey, the majority of participants (n=18) commented on professional development of teachers. Five of them pointed out that in-service trainings were very important for improving teachers' ICT skills and helping them to keep up with the recent developments in technology and education. One of them highlighted that teachers' ICT use was still poor and they needed to be involved in projects to give them a purpose to use ICT. Two other participants further explained that participating in projects also may help teachers to develop ICT skills along with conferences and trainings.

In many other schools, there are teachers who think of technology as a bogey and think negatively about it. There are many teachers who don't even use computers in their class. We need to reach them somehow and make them love technology. In fact, this is due to the teacher himself, unless the teacher wants it, you can not make him do anything. However, the availability of courses for teachers and compulsory participation in these courses may lead teachers to develop in some way (T9).

In-service trainings were provided by Turkish Ministry of Education (MoE) throughout a year. The list of trainings was published on the website of MoE General Directorate of Teacher Training and Development as well as MEBBİS (the Information Systems of the Ministry of National Education). Participation in the courses was voluntary. The teachers were required to register for courses via MEBBIS to participate in the course. There were certain quotas for the courses. 7 Turkish participant explained the concept of in-service trainings in Turkey; the most informative one is given below:

Many courses are given in terms of programming and software as in-service training. In terms of other teachers, basic usage courses are constantly going on and I follow it from the internet. The in-service courses provided by MoNE are free of charge ... Announcements are made *to the teachers in the direction of the letters coming from MoNE, the ones who want to attend are participating. There is no compulsory attendance. Of the people who apply, the MoNE sets the election criteria ... I get favorable feedback from those who attend the courses. They get certificates and, in order to be able to use them later, they are given really useful training for someone who really wants to go and work on it (T11).*

5 Turkish participants claimed that FATIH project encouraged them to take courses regarding ICT. There was not sufficient equipment to use before the FATIH project, so they didn't feel like taking the courses. The courses provided within FATIH project were found helpful by some participants:

There are courses given in the scope of Fatih Project. At the Fatih project, video applications, things reauired for the smart boards, everything we need are taught.... Courses are beneficial both for self-improvement and for being more productive to the students ... Everyone uses technology, but the level is important here. The better the course, the more beneficial for the teacher it is (T1).

The trainings related to information and communication technologies became necessary with the Fatih project now. Before that, there was no technology in the schools, there was no material that we could use anyway, so there was no use in taking these courses (T19).

Although, there were many in-service trainings and courses provided within and beside the FATIH project, some ICT teachers stated that they had hard time to find courses that met their needs. Courses for their level were hardly available due to the absence of educators or lack of sufficient number of participants.

As an IT teacher, there were not many courses to suit me. When I wanted to take an Oracle course, it would never have opened. Database never opened, either there were not enough participants to open the class or there was not a trainer to give the lecture. The in-service training was being included in the schedule, and it was being removed after one week because a trainer could not be found, or due to a lack of sufficient number of people registered and most in-service programs were removed [in this way](T21).

ICT teachers provided trainings for the teachers in the school when necessary. These trainings were mostly related to the FATIH project. For example, under the FATIH project, EBA was introduced and other short time courses were provided. However, concerns about how useful these courses were mentioned. After the trainings, it was not known how much the teachers were able to practice what they learned. One of the participants stated that the time period of trainings were shortened on the teachers' request.

> *I train our teachers when necessary in this school. Upon their request for sure. For example, we have EBA introductory meetings. I showed our teachers the innovations of the EBA portal, what they can find, where they can find them, and I also showed it to the children. Every year we have some studies regarding their introduction. We do it, but I can not tell how many people go to EBA and use it [said in a sarcastic tone] (T9).*

Some interviewees argued that participation to the courses was not much, although there were some exceptions. 6 participants agreed that when the courses were not compulsory, teachers did not want to participate. Teachers had their own excuses not to participate in them. For example, one computer teacher (T11) claimed that she didn't feel like improving her skills up to a much more advanced level since the content of the education to be given to the students would not go beyond teaching basic ICT skills.

A few participants (n=5) claimed that the teachers thought that they knew enough so they didn't fell the necessity of attending any courses. One of them pointed out that teachers did not attend the courses because they thought they already knew how to use technology. He further noted that most of the time the courses were at the entry level, and not compulsory. So, the teachers did not prefer to participate in the courses. Another participant said that he attended to only one course as it was obligatory by the date of interview. Other two participants claimed that some teachers were not willing to devote their time to the trainings because of their busy personal life beside their day job.

> *Teachers do not have time for the trainings due to the daily life struggle in Ankara, so they are not interested too much. Even for the trainings held*

within the school, they are saying, "Mr. Cahit, let's not keep it longer than half an hour" (T21).

Some (n=7) felt that the courses were not useful for the teachers at all while others considered that the courses made a positive effect on teachers' technology use (n=2). The ones who thought the courses didn't change their ICT use claimed that the courses given were either too basic or did not include any new information. Some of them also said that the courses were not in line with their level and not practical. 2 of them pointed out that sometimes the teachers could not put into practice what they learned due to the lack of equipment, in return, this caused them to forget what they had learned after some time.

The training I have taken did not change the way I teach my lessons. I mean it was about basic computer usage; opening or closing Word, Excel pages etc. I already knew these things ... For example, if we had smart boards here, I would go take courses about it to improve myself. Because I would like to use it. But if I take the training for something that is not available, I will easily forget about it, since I am not able to use it (T18).

Regarding the trainings within the scope of FATIH project, some teachers stated that sometimes they learned new things, but they were not able to practice them very much since the information given in the courses were not applicable to real-life situations most of the time. Especially the application named Starboard was criticized by 2 teachers. This application was not appropriate to the level of high school students - it remained rather simple - and preparing an educational material for the application was time consuming for the teachers.

Due to Fatih Project, all our teachers are taking courses, but they do not use any of the things they learned from these courses. For example, there is a Starboard and Antropy program, which are recent stuff. I did not see any teacher doing a study on that Starboard and offering it in class ... The teachers have no time. Now, in their free time, the teachers must sit and work on the Starboard or install it on the computer at his home and work there. In general, our teachers tend to choose the easiest way possible, always thinking of finding something ready to use on the internet, and just use it as it is (T9).

Only 2 participants claimed that they benefited from the professional development courses. One said that the courses offered were useful because the training brought a different perspective into her teaching. Other one highlighted that the courses gave him confidence to use the technology in his teaching.

4.2.3.2.1. Training Content

After reporting the current situation in the professional development of teachers, insight regarding the training content was also provided below. Training content referred to content that was included in the training course provided for teachers to enable self development.

In Finland, teachers were still learning basics aspects of emerging technologies as well as how to use them pedagogically in their classrooms. When a recent technology introduced to teachers, they initially would take the training related to how to use this technology itself. Then they would move onto learning how to use this tool in learning and teaching activities. Trainings related to pedagogical approaches associated with these technological tools were available at the schools and universities.

In S. Korea, the trainings were provided within the scope of Smart Education and Smart Learning which were some ongoing government projects. The content of trainings included various kinds of information literacy skills, technology literacy skills and pedagogical use of tools. The trainings were not only about how to use the tools but also how to teach with these tools in the classroom.

In Turkey, trainings regarding how to use the technology itself were provided when a recent technology was introduced at schools. A training on pedagogical use of technology in the classroom were not mentioned by Turkish participants as Finnish and S. Korean participants did. The content of courses and training within the scope of Fatih Project were not found very useful since the contents remained at a very basic level, and the teachers couldn’t associate it with their actual practices.

Finland

16 Finnish participants provided information related to training content of their professional development courses. The trainings included 2 major areas: how to use technology itself and pedagogical use of technology in the classroom. Most of the participants (n=12) said that the provided courses and trainings were about how to use a particular technology. Only 6 participants mentioned that there were some trainings related to pedagogical approaches associated with these technological tools. The courses on learning how to use the technology remained in the forefront as opposed to learning how to use technology in the teaching and learning process.

Couple of exemplary statements regarding training content of how to use technology itself were provided below. Some schools had just started to use i-Pads at about the same time these interviews made, so some teachers only mentioned learning how to use i-Pads and related software application, while some others mentioned that the instructions about using the applications had recently been introduced. When an emerging technology and/or a new application such as Office365 were introduced to teachers, they were able to get related basic trainings.

> *ICT teacher offers any lessons for teachers: Common level in service training for teachers about how to use textbook online (F7).*

> *Mainly it was about technical things- how to use this [pointing i-Pad]. Not so much how to use it in the education (F13).*

An ICT advisor explained why he primarily tried to teach how to use technology itself. He stated that teachers who normally did not use technology much needed to learn basics of how to use technology first, then they would able to move to learning more advanced content.

6 Finnish participants highlighted that they were able to get courses to develop skills for the pedagogical use of technology in the classroom. Acquiring knowledge and developing skills regarding the use of technology in a particular subject could be

possible in Finland through professional development courses. For instance, following participants pointed out that the courses did not include information only about how a tool worked, but also how it would be used in teaching and learning processes.

> *Mostly ICT studies that I have had are not like only ICT programing but including pedagogical aspect of how to use the technology. The courses provide knowledge about how to teach ICT to students as well… We have given courses in Office 365, Kahoot, and gaming into the lessons (F2).*

> *They really teach other teachers how to use the technology in education, not only introducing the tools (F16).*

Especially 2 participants –F12 had a Ph.D and F13 had a master degree- commented that the adult education provided by universities could help teachers learn and develop techniques for the use of technology in the classroom.

> *Our universities have adult education programs which help us a lot or in higher education…Some teachers have been in the training where teachers get some education how to make best out of technology at classrooms and they have received some certificates as well (F12).*

S. Korea

11 S. Korean participants provided information related to training content of their professional development courses. All 11 participants indicated that the trainings were related to Smart Education and Smart Learning which were ongoing government projects. The content of trainings included various kinds of information literacy skills, technology literacy skills and pedagogical use of tools. Suprisingly, the trainings mostly focused on how to use the tools and how to teach with these tools in the classroom.

> *There are a lot of training sessions for teachers who want to learn and teach with the techniques. I actually took some lessons before I was familiar with the tablet PCs (K2).*

> *There are in-service professional development courses as follows: “How to make multimedia teaching resources”, “Basic issues of copyright”,*

"How to utilize Smart Learning", "Information communication ethics for elementary teachers" (K13).

However, focusing on how to benefit from a particular technology in the lessons did not pose an obstacle against taking courses on technical and basic skills. The teachers were able to reach variety of courses at any time they needed.

I, for example, have received trainings about the implementation of Smart Education and about ICT. Apart from that, some people can get trainings about the use of Office Word or about MS Office (K5).

Whoever wants to learn, they can access easily to ICT, since there are various training programs such as Prezi and Google Spreadsheet etc. (K7).

Turkey

17 Turkish participants provided information related to training content of their professional development courses. Most of them reported that they had taken courses on how to use computers and smart boards. In general, when computers first started to be used at schools in Turkey, most of the teachers had received a training regarding how to use computers. Later, when FATIH Project was launched, the teachers had to take trainings about how to use smart boards in addition.

In particular, 11 out of these 17 Turkish participants indicated that they had trainings regarding how to use the technology itself -in this case, for the computers and smart boards- when an emerging technology was introduced at schools. None of the participants mentioned that a training on pedagogical use of technology in the classroom was introduced.

When the computers started to be used newly in Turkey, we received courses, not about the integration of the computer into the curriculum, but about the use of the computer. The last training we took part in was about the interactive boards within the scope of Fatih project. At the moment there are no different in-service training courses available for us (T3).

Within this Fatih Project, we participated in the information technology seminar for 20 hours about using the smart board. Apart from this, you want to reach a certain point with your own effort (T4).

Some participants (n=3) expressed the belief that the content of the trainings within the scope of Fatih Project was not satisfying. They stated that the courses merely covered the basics and were not relevant enough, so they did not actually meet their expectations in terms of content. As a result, the participants did not find the courses very useful.

Long ago, I attended to an in-service training, something about computer use. We also got a training when smart boards came. At least we had an idea about using the smart board. The course was originally about smart board use, but it also contained different things; the use of the Starboard application is also described. In fact, it was not much about the smart board, it was more like a lecture about the application's own description (T10).

Besides the computer use and smart board trainings, there were other trainings reagarding Microsoft Office programs, AutoCAT, Cisco Systems and eTWINNING portals. Although Microsoft Office trainings were for teachers with all levels of knowledge, others had to appeal to advance level learners such as ICT teachers and advisors. Only one participant, who was a principal, mentioned that he had a training about technology and leadership. This course was also given as a part of FATIH project.

4.2.4. Parents

The last meso-level issues was parents. Parents referred to the involvement of parents in process of technology integration. The parents were involved in some decision-making processes that were applied at schools. For this reason, affirmative or negative attitude of the parents would have an impact on the decisions made related to technology use. Additionally, the parents were supposed to be the ones seting limits for the use of technology at home. In this regard, the parents had responsibilities that would support or hinder the technology use of the children. A total of 20 participants

(6 Finnish, 1 S. Korean, and 13 Turkish) commented on how parents' approach towards technology would use having an impact on technologu use of the students at the school.

Some Finnish participants claimed that affirmative or negative attitude of the parents towards technology use at the school would define teachers' and students' ability to incorporate with technology in the classroom since sometimes permission of parents were needed. At some occasions, parants may need to purchase the technology to be used in the classroom. In this context, limited financial resources of the parents may hinder students' technology use. A higher level of technology literacy of the parents would enable to have their full support in the process of technology integration in education and help them to understand the process better. Parents also needed to take the responsibility of setting the limits of technology use at home as teachers did their part at school.

In S. Korea, the parents were worried that students would become addicted to internet and computer games. However, the parents wanted their kids to have all the opportunities that could be provided to others. That was becaue the teachers put alot of effort into preparation of open-class activity. They wanted to show to parents how their kids got their education. Teachers would incorporate with technology more in their teaching for open-class activities, because they thought the parents would like to see that their kid had all the oppurtunities for their education.

In Turkey, some participants claimed that there was a need to increase awareness of parents about the contribution of technologies to the learning and teaching processes. Because they believed that lack of knowledge and awareness of parents could be a barrier for educational technology use. Parents thought their kids were technology literate, since they could use internet and computer. False parental knowledge and perception of the level of their kids' technology use didn't help them to understand necessity of technology use for educational purposes. They would also didn't see ICT lessons as important as some other lessons.

The parents were considered as role-models, rule makers and enablers for technology use both at school and at home. They were expected to set rules related to technology use at home. However, the parents got worried excessive use of tablets at home for non-educational activities and they banned overall technology use instead.

Finland

6 Finish participants highlighted financial concerns, technology literacy level and responsibility of the parents in terms of supporting technology use of children. Affirmative or negative attitude of the parents would have an impact on the decisions related to technology use at school. One participants claimed that when parents didn't want their kids to use internet at school, this would be considered as a barrier to using technology in terms of educational purposes. Another participant further added that they needed to get permission from the parents regarding the use of technology if the ethical terms are considered.

> *A barrier for using technology could be willingness of the students' home; parents. Parents sometimes don't want their kids to use internet/ICT (F5).*

2 of them stated that when families needed to pay for the technology to be used in the classrooms, they may start to question the necessity of it before they agree to pay for it.

> *Of course, sometimes we have also some negative feedbacks. For example one of our student's iPad got broken in the classroom and his parents were upset about it because they had to pay. Then they start thinking that if it is really good for 6-7 years old kids. We also use iPad sometimes as you saw in math lesson, when we were doing numbers with our fingers or pens, some parents say it is easier to make it in paper rather than making on IPad, so we use both (F14).*

A participant mentioned that it was difficult to explain the process of technology integration into education to the parents and receive their full support somehow. He indicated that this was linked to the level of technology literacy of the parents and their appreciation of it. Lastly, 2 participants explained that parents should take the responsibility of setting the limits of technology use at home as teachers did their part at school.

> *Parents should set the rules of how long the technology would be used at home. Parents should describe the limits. But, at school, with these younger students, we don't sit in the corner, behind the table, we are watching and monitoring what they are doing. Also, we let the parents know, so we have strict rules. When we started the projects related to iPads, we made strict rules (F13).*

S. Korea

4 S. Korean participants contributed to this theme. In S. Korea, parental pressure existed. Each semester, a concept called "open lessons day" was applied for a full day. With this application, parents got the chance to observe how a lecture was given. In one of the schools visited, the open lessons day was observed. The teachers regarded this day as a showing off opportunity and they were trying to get prepared well for the day. On this special day, teachers were doing their best to perfect the way they give lectures, which resulted with deviations than the normal way. Demonstrating an ideal lesson process was the main goal. A teacher (K3) stated that "these days, we use technology more than normal". Another teacher that was chatted with during the observation making process also commented as "when you, as a researcher, visit the classrooms, I can see that the teachers behave differently. Because they do want to seem as a perfect teacher and don't want do anything wrong as they feel in a same way for the open lesson day". They were expecting parents to like and approve their teaching methods. A 9th grade math teacher explained his concerns related to this day:

> *…Because I am doubting about it, I am really worried about this up coming meeting which is in a week (open class). Because that is the way I can make sure that I am doing well (K2).*

Only 1 S. Korean participant mentioned that in S. Korea, some teachers and parents were worried that students would become addicted to internet and computer games, and they considered this as a disadvantage of technology use in education.

> *Some teachers and parents negatively think about ICT because they worry that students are addicted to Internet or computer games (K10).*

In S. Korea, parents wanted their kids to reach every single opportunity that other students had. In other section of the findings, the teachers mentioned that for open class activities, teachers put a great effort into preparation of a single lesson by using all the resources they had including technology. They said that was because they wanted to show their best to families.

Turkey

13 Turkish participants commented on the attitude of parents towards technology use at school and at home. In general, knowledge and awareness of the technology use of the parents were important for technology integration in both environments. The parents were considered as role-models, rule makers and enabelers for technology use both at school and at home.

Some (n=3) thought that there could be a relationship between the positive attitude of the parents towards technology integration and educational use of technology by students.

> *There is definitely a relationship between the technology perspective of the family and the technology use of the students. For example, there were lots of families who registered their children for the school because the school had smart boards. They want their kids to use them, to benefit from them. They want their kids to use the smart board or any technological tool properly (T6).*

Some of the participants (n=5) claimed that there was a need to increase awareness of parents about the contribution of technologies to the learning and teaching processes. For example one of the ICT teachers complained that parental perceptions and knowledge of their children's technology use were false. The parents belived that if a kid could use internet and computer, it meant that their kid was technology literate.

The participants claimed that due to this common belief adopted, parents had the tendency to consider ICT lessons less important than the science lessons.

> *The student proficiency levels are so low. All of the students assume that they are able to use computers, but none of them are really capable of doing it, for example they can't even use Word properly. For this reason, we are trying to explain ICT lessons at a simpler level than they are, but just because children can use the Internet, their families think that every individual who uses the Internet is a computer user too. Therefore, there is a big misunderstanding here, and we are trying to fix it (T11).*

Another ICT teacher further added that the parents did not really understand the importance of the ICT lessons, and they even considered other lessons as more important. She suggested that awareness raising initiatives could be presented at the school meetings with the help of a school counselor.

> *I am expressing it at every meeting. Our school counselor is also trying to raise awareness on this issue at meetings in general. But we also have a lot of students who do not have computer technology in their homes. Therefore, they fundamentally consider math class, science class and such classes as more important. But we should really tell them that their children will be able to understand these courses more profoundly with the help of technology, we should definitely raise awareness (T20).*

Some other participants (n=4) also embraced the same point of view: lack of knowledge and awareness of parents could be a barrier for educational technology use.

> *I do not think they [the parents] really care about or are very aware of it [technology use in education]. I do not think they would know about the difference that technology can make. They usually tend to criticize teachers. They think all failures and evils stem from teachers. They prefer to see our shortcomings completely, but I do not think they spend time to think about what it would be like if education was like this or that at the school. It does not make a difference to them (T12).*

> *Students' parents do not have any role in the integration of the technology unfortunately, because most of our families are primary school graduates, primary school dropouts, people who do not know anything about computers. People who definitely do not know how to use it. So they can not help their children very much. We even have parents who think their*

children are wasting their time when they use computers. It is necessary for parents to get more conscious in order not to have it happen this way. But this kind of perception is common around here. We need to raise their awareness somehow (T20).

4 participants mentioned about parents as a role model for technology use. Moreover, they also said that the parents needed to enable and support technology use of their kids in a way as if this was one of their main responsibilities. They needed to set rules for technology use at home.

The families should support it. They can support by controlling the child rather than hindering it much. They can point the right way for their education [to their children]. They can make getting the right information from the right sources possible for them (T8).

Children learn basic skills related to IT from their parents at home. Whatever they observe at home, they learn it by typing, playing, tampering, and using a tablet (T21).

One Turkish computer teacher claimed that since some parents were doing student's assignments at home instead of their child doing his homework by himself, the students may not even be able get a chance to use computers for their assignments. She further highlighted that this would prevent students from practicing ICT use at home, as a result, students would not gain the ability to build up knowledge.

3 participants claimed that the parents complained about the children's use of the tablets at home. These tablets were given to them under the scope of FATIH project. According to interviewees, the parents said that the kids spent all their time on the table at home. However, the use of tablets did not include educational purposes. They did play games instead. The parents reported the situation and they banned the use of tablets at home.

Parents are always complaining that their child is spending a lot of time at the computer, not studying at home, sitting all the time. If the student is spending 5 minutes studying at the computer, he spends 5 hours playing

> *with it.... The families are banning the computer, but banning it is not a solution, the child goes out to the internet cafe ... It is not the solution to ban the internet at home, it becomes more attractive when you forbid it (T9).*

4.2.5. Summary of Meso Level Issues

A summary of Meso Level Issues was provided in Table 4.4. The summary display of a very intense data and findings of a very detailed analysis could be seen below in order to provide easy navigation and a rapid understanding of similarities and differences between countries. The numbers in parenthesis showed how many participants mentioned related issue, while the letter O refers to the observation.

Table 4.4. *The summary of Meso Level Issues*

Summary of Meso Level Findings						
		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
School Leadership	Provision Resources		Responsibility of the administrators (16) To have difficulty in allocating a budget for ICT expenses (4) Decision-making process not only depending on the principal but also the teachers, city board, the committee providing the equipment and the economic resources (2) Finding new ways to provide a budget or equipment through projects (1)	Responsibility of the administrators (14) A budget allocated only for ICT- related expenses (3)	Providing required components for a properly functioning infrastructure (16) Keeping the equipment and systems available and running efficiently (6) Prioritizing the needs of principals over the needs of teachers in terms of technology purchase (1) Insufficient school budget (3)	• In Finland and S. Korea, the participants agreed that provision of resources for technology integration was the responsibility of the administrators. S. Korean schools had an allocated budget for ICTs. Even if Finland didn’t have a budget for it, they would manage to purchase technologies through projects. • In Turkey, the participants wanted to the administrators make the current technology available and keep them functioning properly. The administrators had a tendency to prioritize their requests and need regarding technology purchases as opposed to teachers’ and school’s needs.
	Encouragement & Support		An encouraging and supportive management would promote technology integration (10)	Administrators encouraging and supporting teachers to use ICT in the classrooms (9) Giving certain awards to encourage teachers to use ICT (2)	Positive attitude towards educational use of ICT responding to teachers’ needs (14) FATIH project made the administration more supportive, but the principals of other schools that	• In Finland and S. Korea, the administrators were encouraging and supportive as well as in Turkey. However, in S. Korea and Turkey, if teachers didn’t request anything from the administrators specifically, the administrators wouldn’t have a tendency to make an effort themselves to enhance the technology integration. Additionally, in Turkey, unless FATIH

Summary of Meso Level Findings						
		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
				If no requests or suggestions received related to ICT usefrom the teachers, the school administration did not seem to make an effort about it (1)	were not in the scope of FATIH project remained neutral and did not make any attempt to encourage ICT use, because this was not a priority at that time (4) If no requests or suggestions received related to ICT use from the teachers, the school administration did not seem to make an effort about it(4)	project was implemented, the administrators would not make any effort.
	Community Capacity Building		The existence of a cooperating community and a strong school governance (7) The community capacity building was one of the responsibilities of school leadership (7)	The leaders of communities and a role model for teachers' further use of technology (4)	Establishing trust, modeling, empowering the motivation of teachers and facilitating bureaucratic procedures (5)	• In each country, community capacity building through empowerment of a shared vision, providing professional learning opportunities as well as sharing ICT leadership were considered as the responsibility of administrators.
		Shared Vision	The existence of the strong community ties in the process of making decisions to	The lack of a shared vision and a strategy for the development of a mutual understanding (7)	There was not a tangible vision adopted or strategy employed in the schools (11)	• In Finland, the focus was on co-determining the plans and implementations of ICT use, in turn, that would facilitate implementation of

Summary of Meso Level Findings

Themes	Sub-themes	Countries / Categories	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
		Categories		Findings at first Glance		
			form a mutual understanding (6) A strategy at both school level and city level was developed by teachers and administrators (15)	The vision and personality of the administrators would determine the approach against ICT use (5)	A vision formed around FATIH project (11) Spontaneous and unplanned implementation (3)	the decisions better and create a mutual vision. • There was not a common and predetermined vision or strategic plan in the S. Korean schools, however individuals were able to built their own vision and implement it somehow. • In Turkey, there was not a tangible vision adopted or strategy employed. The use of technological tools provided within the scope of FATIH project was detected as a vision. Additionally, taking an action to support the technology integration was not a planned event but something rather remaining in words and not properly enforced by the authorities or the school administration itself.
		Shared ICT Leadership	The guidance for the teachers was a focal point of the shared ICT leadership at both city and school level (13) There were ICT advisors or a group of teachers or an ICT group assigned by the principal at school level and a coordinator at city	There was not any related comment on shared ICT leadership	The school management's point of view was determining the school culture. Adoption of a shared leadership style as well as the creation of shared vision was depending on the school management's view itself (4)	• In Finland, there were principals, a group of teachers, ICT advisors, coordinators and academicians who shared ICT leadership to create a shared vision and guide others. • In Turkey, there was not a discourse indicating the view of a shared leadership. There was a more authoritarian leadership style due to a centralized educational structure. Sometimes a shared ICT leadership would not even be a matter of discussion since administrators, other

Summary of Meso Level Findings

		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
			level as partners in the ICT leadership in order to provide help and guidance in technology integration process (13) The university academicians were involved in this process of guidance (1)		That the implementation of FATIH project being independent of the principals, increased accessibility of the technological devices (1)	teachers, students, and parents did not perceive computer lesson as one of the important lessons. • S. Korean participants didn't particularly mentioned shared ICT leadership.
		Professional Learning	An enabler and a sponsor for the learning (3) Joint decision-making in the professional learning process (3) Very supportive administrators in terms of enabling professional learning of teachers (4)	Providing more opportunity for professional learning was depending on principals and teachers (2), but they thought that MoE provided enough training and there was no need for extra courses (2)	Providing and supporting professional learning was the role of school management (3) Difficulties in the access to the courses due to unplanned training process (3) The teachers' leave to attend to the trainings wouldn't be approved by the school management because the classes wouldn't able to have a substitute teacher (4)	• The administrators in Finland were providing financial support and they did not have any difficulty in giving the necessary permits for teachers to take professional learning opportunities. • In S. Korea, even if the participants thought that the school management should provide opportunities for teachers to take various trainings, they claimed that this was not the role of just the school but also the responsibility of other higher level institutions. On the other hand, in Turkey, the participants pointed out that it was difficult to get the necessary permits from the school administration just to attend to required trainings as a part of the school community.

Summary of Meso Level Findings

Themes	Sub-themes	Countries / Categories	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
			Findings at first Glance			
						Furthermore, they also complained that the courses were not very organized and planned either.
	Permissiveness		A leadership that was not repressive and originated from their understanding of shared ICT leadership and shared vision existed (10) A consultative leadership style rather than an authoritarian one (5) ICT use was something expected from the teachers (3)	There was neither pressure nor guidance to use ICT at the schools (2) No need to put pressure on the teachers to use ICT anymore, since it was already used excessively (2)	Supportive of the use of technology rather than putting pressure on the teachers to use technology in the classrooms (5) Lack of pressure didn't contribute to technology use of teachers since teachers tried to meet only minimum requirements in classes (3)	• In Finland, jointly-determined decisions eliminated the pressure from the authorities to determine everything on their own. So, a consultative leadership style rather than an authoritarian one helped teachers' use of ICT. • In S. Korea, the use of technology was considered to be at a sufficient level by the teachers and there was not much motive stimulating the use of technology so often and so much anymore since it was already a natural part of daily life. • In Turkey, the school management was also more supportive of the use of technology rather than putting pressure on the teachers to enforce it in the classrooms. But, since the lack of enforcement did not seem to enable more communication and co-operation, the teachers were in opinion of that the administrators did not give much importance to technology integration.
Participatory nvolvement			A strong sense of community	More in favor of privacy and self-taught individuals	Not enough collaboration and knowledge exchange between school	

Summary of Meso Level Findings

Themes	Sub-themes	Countries / Categories	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
				Findings at first Glance		
					members except for the department meetings	
	Community of Practice		Systematic group meetings (3) The presence of an organizational learning concept - a colleague based ICT tutoring (5) Knowledge sharing at the collective level - a learning community (5) Solving the problems through cooperation and knowledge exchange (8) The importance of encouraging collaboration rather than working alone in the process of ICT integration (3) Building a cooperative atmosphere created by sharing course materials prepared especially when the	There was collaboration between teachers regarding the knowledge exchange through department meetings, open-class observations, and the colleague based ICT tutoring that enabled technology integration (6) Teachers tended to do their learning and teaching individually rather than collaborating (7) S. Korean teachers would feel intimidated to share their classroom practices (1) Having a busy teaching schedule wasn’t helping the collaboration of teachers (1)	Regular department meetings enabled teachers’ knowledge exchange in a way (8) The cooperation was limited to only members of the group (3) There was not enough collaboration and knowledge exchange between school members except the department meetings (4) Minimum level of knowledge and material sharing took place between teachers, since it was not a very common practice (1) Lack of a department meeting for ICT subject since mostly there was only one	• In Finland, knowledge exchange and sharing between both school staff and community members of other schools took place more often than they seemed to happen in S. Korea and Turkey. Finnish authorities and school community members were supportive of group meetings, discussions and the colleague based ICT tutoring. In S. Korea and Turkey, knowledge exchange and sharing were mostly limited to department meetings. In S. Korea, the open-class activity as a common practice became prominent among other activities. In Turkey, monthly held department meetings could be considered as collaboration and knowledge exchange activity examples.

Summary of Meso Level Findings						
		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
	Informal Knowledge Exchange		materials were for the same subjects (4) Having a chat in the coffee/tea breaks were their way of exchanging knowledge with others (7) Their working culture had changed: Teachers and students had more casual interaction in order to share experiences and knowledge (3) Consulting or collaborating with a responsible teacher acting as an ICT leader and other teachers at any time without a planned or structured manner (7) Social media (Facebook), cloud technology (Dropbox, box.com, Google Drive) and a game-based learning	Facebook groups or other groups formed via some other independent S. Korean community websites were used for informal knowledge exchange (4)	ICT teacher in each school (1) Consulting with the computer teachers (6) Using chat platforms (Facebook, WhatsApp) for instant communication (4) Casual knowledge exchange (2) An independent website for computer teachers used across the country (1)	• In Finland, most of the participants stated that the pedagogical technology use and the issues that may occur in the process were discussed in the coffee/tea breaks. Moreover, they were comfortable to ask their relevant questions to other community members and seek for help anytime. The teacher who was responsible for ICT related issues would help them sometimes. • In S. Korea, the participants preferred to join Facebook groups or to the groups formed via some other independent S. Korean community websites for informal knowledge exchange. • In Turkey, the teachers seemed to ask for help from ICT teacher casually when they had problems. Moreover, they mostly used Facebook and WhatsApp for communication.

Summary of Meso Level Findings

		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories	Findings at first Glance			
			platform (Kahoot) for knowledge exchange (6) Switching classes or doing joint classes together (3)			
Teacher Development	Teacher Knowledge and Skills		Lack of teacher knowledge and competency posed a barrier against technology integration (7) Teachers' education was not providing sufficient knowledge of teaching methods or relevant skills in terms of supporting teachers' ICT use in education, but the Finnish teachers had a high level of competency anyway (4) Lack of know-how transfer/ the necessity for the improvement of role model teachers' ICT	Lack of teacher knowledge and competency posed a barrier against technology integration (6) Teachers' education in S. Korea provided opportunities and necessary experiences for teacher candidates (4) The teachers' skills of ICT use were assessed and ensured by the school and government through ICT certification and a demonstration lesson (4) Each teacher would be assumed to already have the	Lack of teacher knowledge and competency posed a barrier against technology integration (5) Necessary pedagogical and technical knowledge should be gained in the university (6) Teacher candidates needed to graduate with required knowledge and set of skills to deal with FATIH project but that was not the case (4) Big difference between the education that ICT teachers received and the education	• In Finland this situation varied based on the university and people involved in the related environment. The lack of know-how transfer was emphasized. • In S. Korea, the participants thought that teachers' education was able to provide opportunities and necessary experience for teacher candidates. It was emphasized that technology was frequently used in everyday life by the teachers and the teacher candidates. But, it was also said that their skills may not go beyond the point of making a PowerPoint presentation. • In Turkey, the lack of education on pedagogical use of technology was emphasized by the participants. The government was developing technology-oriented policies such as the FATIH project, but some participants expressed the belief that the experienced and newly graduated teachers didn't really have the required knowledge and set of skills to use

Summary of Meso Level Findings						
		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
			skills in training schools (3)	necessary knowledge but it might not go beyond a the level of ability to prepare a PowerPoint presentation (2)	they had to provide at the school (1)	technology offered by the project efficiently. So they thought the newly graduated teachers were not equipped with the necessary set of skills during their studying.
	Professional Development		AVI, city board, academics / university, private companies, school administrations and experienced teachers were providing professional development activities (4) There was a common practice to prepare ICT-related projects, provide the corresponding and supporting trainings for the teachers based on the objectives of the project, and meet the expenses from the project budget (7) Conferences and meetings associated with the projects	MOE, POE, Seoul Education Training Institute, On-line training institute, teachers' community, and private companies within the scope of some projects were providing the professional development activities (5) A lot of online and other types of courses for teachers were available (8) The technology was already being used naturally by everyone, so the ICT related courses were not compulsory anymore (10)	Turkish Ministry of Education (MoE) would provide in-service trainings throughout a year (7) ICT teachers would provide FATIH project related courses, even if they were not so popular among the teachers (4) Teachers were encouraged to take ICT related courses by the FATIH project (5) When the courses were not compulsory, teachers did not want to participate (6) due to having sufficient knowledge already (5), lack of advanced	• Providers of professional development activities varied among the countries. • In each country, the courses were not compulsory. Teachers could choose, request and attend to any kind of courses they wanted. In Finland, involvement in projects, conferences and meetings were prominent for the sake of professional development. ICT related professional development was mostly supported by teachers with ICT education background or teachers with better ICT capabilities. There was a collaborative work amongst academicians, ICT coordinator, and teachers in order to provide more opportunities to teachers from different schools. A need would determine the necessity of a course. Although, efforts for enhancing the professional development of teachers' ICT skills were observed, some problems regarding the level, consistency,

Summary of Meso Level Findings						
		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
			were another way of improving teachers' ICT knowledge and skills (3) The trainings including in-service trainings were provided based on the needs in the school or teachers' individual needs and requests (6) ICT related professional development was mostly supported by teachers with ICT education background or teachers with better ICT capabilities (12) Providing more training opportunities for all the teachers in the Joensuu city was a collaborative work with academicians (4), ICT coordinators (2), and teachers (4)		level courses (2), and having a busy personal life (2) The courses were not useful for the teachers at all since new information or applicable information were not provided (7)	structure and content of the courses available to teachers were identified. • In S. Korea, a lot of online and other types of courses for teachers were available. Teachers were responsible of their own professional development. Everyone was now thought to have enough ICT competency, because the technology was already being used naturally by everyone. • In Turkey, FATIH project encouraged teachers to take courses regarding ICT since they should be capable of using the tools that were available in the classroom with the help of project. However, some teachers were not satisfied with the level and content of the courses available to teachers. They were either too easy for them or useless in terms of real-life practices. If the courses were not compulsory, teachers would not want to participate in. Some thought that there was no reason to advance their skills, since the curriculum didn't require an advanced level of teaching skills with the technology. Some others believed that they knew enough so they didn't feel the necessity of attending to courses. Additionally, some were too busy in their personal life, so they

Summary of Meso Level Findings						
		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
			Teacher training schools had more support and opportunities in terms of professional development of the teachers and collaborative work (4) The short-term courses were inadequate (7) The trainings were not accessible sometimes (3) Lack of advanced level ICT courses (5)			didn't want to devote extra time to these technology use related courses.
		Training Content	The provided courses and trainings were about how to use a particular technology (12) Some trainings related to pedagogical approaches associated with these technological tools were available (6) In the case of introducing a new	The trainings were related to Smart Education and Smart Learning which were the ongoing government projects (11) The trainings were not only about how to use the tools but also how to teach with these tools in the classroom (6)	Trainings regarding how to use the technology itself were provided when an emerging technology was introduced at schools (11) The content of courses provided within the scope of FATIH project were considered to be not useful (3)	• In each country, when a new technology was introduced, teachers would learn how to use technology itself first. But only in Finland and S. Korea, the trainings included pedagogical use of ICT along with a standart training.

Summary of Meso Level Findings						
		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories	Findings at first Glance			
			technology, they would learn how to use it first (4)		A training on pedagogical use of technology in the classroom (0)	
	Parents		Affirmative or negative attitude of the parents could define technology use in the school (1) Parents’ financial situation may limit technology use since they needed to purchase them for the kids on some occasions (2) A higher level of technology literacy of the parents would help them to understand and support the process of technology integration (1) Setting the limits of technology use at home was responsibility of the parents (2)	Parents were worried that students would become addicted to internet and computer games (1) Incorporating Technology in their classrooms more than normal for open-class activities in order to show parents that they benefited from everything they could for their kids education (3)	A need to increase awareness of parents about the contribution of technologies to the learning and teaching processes (5) Parents didn’t consider ICT lessons as important as some other lessons (2) Parents were role models and rule-makers for technology use at home (4) Concerns related to excessive use of tablets at home for non-educational activities made parents ban the overall use of them instead of just setting rules (3)	• In Finland, in some cases the parental permission was needed to use technology in the classroom. So, the family’s affirmative or negative attitude would define the use of technology in the classroom. When the parents needed to purchase necessary tools, the financial limitations of the parents would have an impact on the technology use. Parents’ higher level of technology literacy would help them understand and support technology integration in education better. Parents were expected to set the limits of technology use at home as Turkish participants also mentioned. • In S. Korea, parents were worried that students would become addicted to internet and computer games. However, they still wanted their kids benefitfrom the technology since everybody else would be using it somehow. There could not be such a thing as their children would miss out on this opportunity. • In Turkey, there was a need to increase awareness of parents about the

Summary of Meso Level Findings						
		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
						contribution of technologies to the learning and teaching processes. Because they believed that the lack of knowledge and awareness of parents could pose a barrier for educational technology use. Parents thought their kids were technology literate, since they could use internet and computer. False parental knowledge and perception of the level of their kids' technology use didn't help them to understand necessity of technology use for educational purposes. They would also didn't see ICT lessons as important as some other lessons.

4.3. Micro Level Issues

Unlike the macro level and meso level issues reported previously, micro level issues focused on the aspects directly related to classroom and learning environment. Micro level issues included 2 main themes: Status of ICT integration, and teacher-related aspects. Status of ICT integration had the following sub-themes: ICT skills acquisition process, reasons of ICT use, and misuse of technology. ICT skills acquisition process was categorized into three: Holistic approach, independent status of ICT courses, and responsibility of teaching ICT skills. Categories under 'reasons of ICT use' were affordances, diversifying the methods, and motivator. Teacher-related aspects included teacher autonomy, personal interest, pedagogical approach, role of teacher, teachers 'resistance to technology use, and teachers' use of ICT. Lastly, teachers' use of technology was categorized into two: Available content and available time. Table 4.5 below presented the issues and sources of micro level.

Table 4.5. *Micro level issues*

Micro Level Issues	Sources	F	K	T
• ICT Skills Acquisition Process				
▪ Holistic Approach (F+K)	24	16	5	3
▪ Independent Status of ICT Lessons (K+T)	43	14	15	14
▪ Responsibility of teaching ICT skills	39	15	13	11
○ Reasons of ICT use				
▪ Affordances	36	10	11	15
▪ Diversifying Teaching Methods	45	15	13	17
❖ ICT as an optional tool	45	16	16	13
▪ Motivator	23	12	6	5
▪ Misuse of Technology	31	10	7	14
• Teacher-related Aspects				
○ Teacher Autonomy	32	12	10	10
○ Personal Interest	48	18	15	15
○ Pedagogical Approach	30	14	5	11
○ Role of teacher	38	11	12	15
○ Teachers' resistance to technology use	32	12	5	15
○ Teacher Motivation	35	15	5	15
○ Teachers' use of ICT	50	14	17	19
▪ Available Content	25	12	3	10
▪ Available Time	21	11	5	5

4.3.1. Status of ICT Integration

Status of ICT integration referred to the current situation of ICT integration inside the classroom. As an attempt to understand the current situation of ICT integration, the approach of the countries to the ICT skills acquisition process were revealed. Then, teachers' reasons for using technology in the classroom were reported in relation with the adopted approach. Lastly, misuse of technology by the students and how this affected the use of technology in the classroom were presented.

In Finland, according to the participants, teachers help students to improve their ICT competencies within the learning and teaching processes rather than providing separate lessons for it. Finnish teachers aimed to teach correct and effective use of technology as a part of their classes. However, Finnish schools still provided optional ICT-related courses. The courses were arranged based on ability and availability of voluntary teachers. They were not mandatory courses. S. Korea and Turkey provided ICT-related courses by emphasizing the independent status of the subject. In both countries, while the independent courses were still being provided, the total hours of the courses had been reduced.

Affordances of the technology constituted one of the reasons why teachers used it. These affordances included learning experience enrichment of the students, instant access to limitless information and course materials, encouraging collaboration and communication, and enhancement of visualization. To enable the diversification of the learning and teaching methods was another reason for technology use. And the last reason emerged was that the technology became a motivator for the students.

4.3.1.1. ICT Skills Acquisition Process

ICT skills acquisition process referred to an approach that determined the support acquisition of students regarding the development of ICT-based skills. ICT skills acquisition process included holistic approach, independent status of ICT courses, and responsibility of teaching ICT skills as its sub-theme. There were differences and similarities in how the countries approach integrating ICT in education in order to empower ICT competencies of the students.

While Finland adopted a holistic approach by placing ICT competencies among the objectives of compulsory courses such as math and crafting classes, in Finland, ICT skills were featured since they were considered as a complementary element in the delivery of education. In S. Korea ICT competencies (basic skills and/or programming) were thought as a part of some specific courses along with the emphasis on the independency of the subject. However, these courses were not designed to develop only ICT competencies of the students. In Turkey, there was a separate class targeting only the improvement of students' ICT skills. In the education systems of S. Korea and Turkey, the utilization of different softwares or programming skills were considered as the course objectives, however the ICTs were not specifically featured as a tool employed in learning purposes for other classes.

Participants from 3 different countries made varying contributions to the description of the teachers' role in the process of technology integration. For example, while Finnish participants defined the role of teacher as a facilitator in learning for the educational use of technology, S. Korean participants describe the teachers' role as follows: guiding the students to make them gain the understanding of technology ethics, providing tools in educational purposes, and delivering appropriate learning recourses. From the discourses of Turkish participants, two very distinct and controversial definitions regarding the teachers' role emerged: facilitating their instructional methods with a teacher-centered approach and being a guide/role-model.

4.3.1.1.1. Holistic Approach

Holistic approach referred to the development of ICT skills being embedded into learning objectives of national curriculum subjects. A holistic approach was adopted by Finland. Since the content knowledge and ICT competency shouldn't be delivered separately, a separate lesson was not necessary to acquire ICT competencies. Even if delivering content knowledge and ICT competency at the same time was time-consuming due to taking immediate action against any lack of technological skills, this approach found effective.

Even if S. Korea had independent courses including content of programming and basic skills, still ICT integration in the other subjects was not neglected. Importance of holistic approach rather than having ICT competency as an isolated learning objective were highlighted. Some participants also mentioned that use of technology would be meaningful when integrated into the classrooms since it was a part of the whole.

In Turkey, the necessity of a holistic approach was indicated. Even if the FATIH project was an attempt to embed ICT skill acquisition into subjects, some teachers claimed that it failed due to students' lack of practice opportunities that required technology use in the classroom.

Finland

Most of the Finnish participants (n=16) stated that ICT was integrated into each subject rather than being an independent course. ICT competencies were considered as subject-specific learning objectives. ICT lesson was used to be an independent course in the past, however currently, in the curriculum, it was mentioned that ICT must be a part of the learning and teaching processes. Thus, all the classroom and subject teachers used the technology and thought how to benefit from ICT as a learning tool within their lessons.

> *In our curriculum, we have ICT but it is not a lesson. We do not have a subject called ICT. ICT is inside other classes. When I used to teach, I took my students to the ICT classroom and told them to prepare posters or videos instead of telling them to use ICT tools first. We make it more real curriculum idea task like more integrated…All the teachers do that. There is no subject matter teacher like ICT. Some of the teachers are better in ICT compared to others…We use the ICT in different subjects. Some of classes use it a lot than the others (F7).*

Some teachers (n=3) expressed the belief that the content knowledge and ICT competency shouldn't be delivered separately. When the content was being introduced, the student had already been using technology and learning how to use it. They did not think that a separate lesson was necessary to acquire ICT competencies.

> *I personally think that for these younger students we have to teach "content and competence" at the same time. They are combined. Competence with these ICT equipment. We have something for example forest animals (fox, bear ...) in our curriculum, and we have to learn what they do and what they look like, but at the same time we can use ICT machines- i-pads, tablets and they learn how to find information, how to make presentations, how to do presentations, how to make videos, how to use information, how to gather information... (F13)*

When a task to be performed with the help of a new technology during the course, students were encouraged to think about how to use this technology step-by-step first, then they switched to performing the task. ICT skills acquisition was included in the learning and teaching process. However, some participants (n=6) claimed that this process was sometimes time-consuming but effective though. One of them stated that in essence, teaching how to use technology was not different than teaching how to write.

> *I wouldn't say I had problems introducing a new technology, it just takes more time. For example, it took so much time to move and trim that text for book creator. We did all the steps together… We don't use different apps a lot with first grates. We use a lot the same, and then try some easy app, play with some app where they can practice, they can do it by themselves (F14).*

An immediate action was taken against any lack of technological skills of students in the classroom. Even if just one student was not able to make use of the technology available in the classroom, and this affected the feasibility of the any task to be completed, the teachers would take it very seriously and showed special care to that one specific student and then the lecture continued. Two of the participants provided examples of technology use. They further explained how they use them during learning and teaching processes as an example of holistic approach.

We use apple TV to share something from teachers or students i-pads. We use something from the internet on the laptops, and we use these i-pads as document cameras. For example, when teacher shows how to make clay, one student films the teacher by iPad camera. Then, all students can see it on apple TV, while they are sitting on their own seats. So, they just sit and watch the show. It is filmed at the same time, so the teacher get material for his next lesson… Students can send messages, e-mails. We have "Edmodo" - school Facebook. It has message board, they can send message here during the lesson or on their leisure time as well. We have 2 groups here. One for school work, one for free time group. For example one student send 7 seconds video which was filmed from a car. It was named I am going to Mikkeli"- it is a city nearby. This is my b-day cake, this is my puppy... They share their life (F13).

S. Korea

Even if S. Korea had independent courses including content of programming and basic skills, still ICT integration in the other subjects was not neglected. 5 S. Korean participants emphasized the importance of holistic approach rather than having ICT competency as an isolated learning objective, while 1 participant thought that Turkish and S. Korean technology integration status were similar. A computer teacher explained:

I usually use various teaching materials through web search such as videos, flash games, songs, etc. Students are quite interested because teaching resources from various web sites are up-to-date and also they can give a lot of fun to the students. My students and I also go to the computer lab once a week to learn utility programs such as office programs since they are useful for them to make project, some school homework or presentation (K13).

A high school English subject teacher expressed the belief that "technology and education are in a deep relationship" (K20). Additionally 2 other participants claimed that the use of technology became meaningful when integrated into the classrooms since it was a part of the whole. One of them elaborated her point of view as follows:

The technology is meaningful when it is integrated into classroom. It is like English class. In English class, they can learn about the world, vocabulary, grammar and so on. But they should use the English through *presentation, and conversation. The technology is just like that. Just learning how to use them doesn't mean anything (K3).*

Turkey

Only 3 Turkish participants commented on this issue. A principal pointed out that ICT courses should not be given as an independent subject, because this would separate it from other subjects. He explained the necessity of a holistic approach towards technology use:

> *Technology should be used effectively within that class rather than having technology use as an independent course. In secondary school, it may also be an elective course. I think that if a student wants to make more progress, this course can be given as an elective course. Since the technology will be used along with all the courses in this way, we won't be separating it and the education will be more effective, the students also will think that the technology use in education is necessary (T14).*

A computer teacher claimed that having smart boards in the classrooms somehow make students and teachers use them in all kinds of classes. However, she further noted that instead of providing practice opportunities that required technology use, teachers tended to ask for research assignments that needed to be done after school. A primary school vice principal also confirmed that the teachers tried to promote technology use by giving research assignments as homework. Moreover, he said that at school, he was being helpful about teaching kids how to use technology in order to reach right information on the internet.

4.3.1.1.2. Independent Status of ICT courses

Independent status of ICT courses referred to the availability of a separate ICT course dedicated to teaching how to use technology. Finland had an integrated approach, but they still offered ICT related courses appealing to the students' point of interest based on competency level and availability of teachers as well as upon students' requests. The competency level and availability of a voluntary teacher who were interested in providing these courses would determine the content of the courses. The national curriculum did not include these optional courses, but once the courses were approved by the administrators they were included in the school curriculum additionally.

In S. Korea, there were ICT related independent courses teaching not only how to use technology, but also how technology actually works. The required set of ICT skills was gained through Practical Arts and Technology and Home Economics as well as other optional courses. In the past, there were more effort to provide basic ICT courses. However, as participants claimed, now that the ICT competencies of students were at a certain level already, there were no need to pay attention to any separate courses or intensive instructions on how to use a specific tool. There was a shift in the learning objectives from learning how to use technology towards learning how technology works.

In Turkey, at elementary school level, there were separate ICT lessons. However, participants still pointed out the need for more mandatory courses and the need for higher competency level of ICT literacy for the students. Some participants thought that the acquisition of ICT competencies was depending on ICT courses and teachers, so they supported the idea of having separate courses. Additionally, the content of ICT courses was found simple and insufficient by computer teachers. The computer teachers also complained about not having a textbook that they could follow.

Considering independent status of ICT courses in each country, they all had some sort of separate elective or mandatory ICT-related courses. Even if Finland had an integrated approach to ICT education, they provided extra courses to help students to advance their specific ICT skills. S. Korea and Turkey had similar approach to ICT education, but their implementation was different. Moreover, the content of their courses was different, because their students' ICT knowledge was at different levels. S. Korean teachers believed that students no longer needed to learn how to use technology, but how it actually worked.

Finland

14 Finnish participants gave insights regarding optional courses that students could choose based on their availability. All ICT-related courses were optional that students could choose from the elective courses list. Some teachers called the ICT lesson as a voluntary course since they needed voluntary teachers to teach the course.

> *There are no compulsory courses in ICT in the schools. Some schools have some courses you can choose but not even all the schools have them (F5).*

In Finland there was not a separate ICT course dedicated to teaching how to use technology. Finland had an integrated approach, but still they offered point of interest courses based on knowledge and availability of teachers as well as upon students' request. Thus, these courses weren't available in all the schools all the time. A Finnish principal explained:

> *We don't provide a specific ICT lesson, it is not a real subject. There are some point of interest lessons. They are elective lessons for 7th to 9th grades…Mariita and Olli [ICT-related teachers] teach those lessons. They are quite nice and popular lessons… Every school can decide on these elective lessons. Elective lessons are not regulated, so schools don't need to put any elective lessons related to ICT… If you don't have teachers, if you don't have enough resources or machines, you don't have to, though we have and we put these elective lessons (F16).*

Not every school had an ICT specialist in Finland. However, there were teachers who were interested in ICT. In this regard, the content of the courses were determined by the teachers who were interested in providing these courses. The courses needed to be approved by the administrators first of course. As the context of the courses were based on knowledge of the voluntary teachers, the context varied in each school. 3 Finnish participants from 3 different schools described the content of the courses offered. The elective courses were mostly about hardware, software, internet, safety. These voluntary courses were not included on the national curriculum as standard, but once the courses were established, they were included in the school curriculum additionally.

We have these extra ICT courses, it is not in the national curriculum. If you want, you can choose ICT-studies in our school. It is on school's curriculum. I think Mikko has been teaching ICT in primary school. He opens the courses if there are enough students who pick the course (F4).

S. Korea

15 of 20 S. Korean participants provided insight regarding independent status of ICT courses. In S. Korea, there were couple of independent courses covering an ICT-related content. The courses alone did aim to teach not only how to use technology, but also how technology works. The national common core curriculum included "Practical Arts" disciplinary group in elementary school offered at 5th and 6th grade. In middle school and high school there was a lesson named "Technology and Home Economics" under liberal arts disciplinary group. Additionally, optional and extracurricular activities also supported students' ICT competencies. Optional activities included subject-related and creative activities. Creative experiential learning activities included autonomous, club, voluntary and career activities. Extracurricular activities included again autonomous, adaptive, self-development, social service, and event activities.

A middle school principal explained the system. He further noted that in primary and middle schools, technology was not used commonly, so government tried to integrate the technology in those educational levels more through the smart education initiative. However, he still thought that he didn't need to use any ICT tools while he was teaching science lessons.

In S. Korea, currently, the ways technology worked was mostly featured rather than taking into consideration the ways of using it. A classroom teacher further noted that when ICT education had started, teachers initially taught students how to use technology. But now, they started teaching computer algorithms rather then how to use a computer. He claimed that this showed that ICT was a part of a whole in process of education.

Previously, when we started to take these technologies and apply them in our school, we taught them how to use Word, how to make a PowerPoint presentation, or how to create graphics in Photoshop ... we especially taught these. What we do now is to tell the students the basics of the computer rather than how to use it. The relationship between education and technology is that all of them are interconnected and ICT is also a part of the whole (K4).

5 participants gave details about implementation of ICT teaching and learning activities. They stated that there was not a single subject dedicated to ICT literacy, but there were subjects, optional and elective courses that employed an objective of developing ICT literacy skills of the students. While some of them pointed out that the competencies were embedded into technical lessons, others defined ICTs as cross-curricular competencies:

It is impossible to train students how to utilize ICT because there isn't any certain subject named ICT (no separate subject). However, It is possible to enhance basic skills to use ICT by integrating with other subjects (Creative Experiential Activity time or general course time) (K15).

2 participants indicated that since the ICT-related lessons were not mandatory, some schools just chose not to include them in the curriculum. One of them claimed that they didn't have an ICT teacher, if they did, advanced ICT courses could have been provided.

There is not mandatory course, it is selective. I don't think my school has any curricular activity for that. Because we chose not to do it. This depends on the school (K2).

If there was a computer teacher in our school, he would teach technology skills at more advanced level, like Photoshop or advanced level of Excel (K3).

In the schools, there were not an ICT teacher. Technical subject teachers were functioning like ICT teachers. One of the participants claimed that ICT training was needed before, but now, as everyone knew how to use technology, these trainings were not interesting for the students anymore. As a result, there was no need for a subject teacher, since it was now assumed that students knew how to use technology well enough. Moreover, other participants further noted that the number of computer lessons was reduced or these courses were completely removed from the curriculum. Students were able to learn the ICT literacy by themselves.

> *In the past, people were pleased with being involved in with technology a lot, but now they don't need such training, as they already know [how to use it]. So the computer teachers are not needed much (K5).*
>
> *Usually technical subject teacher is like ICT teacher in the school (K9).*
>
> *Computer classes are being reduced or abolished… There is not a computer teacher (K17).*

3 participants explained that sometimes some teachers took their students to the computer labs to make them improve some ICT skills in accordance with their subject matter objectives. One of them also highlighted that after school, some students took computer lessons in order to learn how to use productivity tools and programming like Scratch.

> *Students go to the computer laboratory once a week. They usually study how to use productivity tools and often search information or make their presentation and reports by using the tools… They also take computer lessons after school at the computer laboratory; productivity tools and programming like Scratch (K10).*

Interestingly, one of the participants was concerned that if the coding course became an independent and mandatory subject, the work load on the students would increase. Moreover, he expressed the belief that making coding a mandatory part of the curriculum would make students to go to Hagwons (a for-profit private institute), because S. Korean students were very focused on studying. For this reason, he thought that technology education should not be mandatory. Lastly, a middle school principal shared his insight on Turkish and S. Korean technology integration. He also claimed that the ICT training given to the students was quite good, referring the observance that the students were good at technology use compared to their teachers:

> *I think Turkey is also good at technology integration and ICT education. S. Korea and Turkey are very similar when it comes to the way of thinking, languages and culture…S. Korean students can use computers and some technology better than teachers can. Students and kids are very good at using technologies. As you know the level of use of ICT is very high, everybody is very good at using computers. I think ICT education level is very high (K6).*

Turkey

14 Turkish participants provided information regarding ICT courses and their function. In Turkey, there was information technology lesson as a separate course. This course was mandatory for 5th and 6th graders, while it was only optional for 9th graders. One of the participants explained that since there was not an ICT related course in elementary school, they tried to improve students' ICT skills over club activities and projects.

With sufficient student participation and administrative requests, ICT courses would be open for 7th, 8th, 10th and 11th graders. However, this was not the case most of the time.

> *Information Technology course is mandatory in 5th and 6th grades. 7th and 8th grades can normally take it as an elective, but it is not opened because the administration does not choose it to be.... When there is not much demand from the students, the courses are not offered. In fact, it may be offered as an elective at 7th and 8th grades, but in general, they don't open the course since they don't need it thinking we already have it at 5th and 6th grades, why should we have it at 6th and 7th grades too (T11).*

Some teachers (n=5) indicated that they would like to have more mandatory ICT-related courses with increased hours in order to manage to standardize students ICT skills. For example one of them said that ICT related courses should have been mandatory at any grade instead of optional in order to bring the ICT skills of students to a certain level. They also claimed that when students moved to the next grade, they didn't have standard and sufficient skills.

... I would prefer that ICT was a must course rather than an elective ... We should have it as a must course even for the lower grades, so that it gets common and students can learn it (T1).

I do not think that the students move from primary to secondary school, with a sufficient knowledge of information technology. If the family supports or if they are able to learn it on their own, they learn it. When they go to the secondary school, the teacher helps them at 5th grade. But in this way, I think they move to the upper levels without setting up a proper substructure (T17).

5 Turkish participants highlighted the necessity of providing ICT courses and/or ICT teachers. One indicated that it was important for students to improve the ability to choose the right and proper information from the available sources. Other two believed that the ICT skills of students had improved when there were ICT lessons and computer teachers.

IT teachers can't be eliminated from the system. Students really need to be educated at a certain level. Students need to have it at a certain level. Students are required to take at least this level of education in order to be able to prepare their own homework. It can be given at only one grade or during the first 5 grades, it can be at the level at which they begin secondary school, but I think it should be given anyway (T11).

I've observed that children learn much better when there are computer classes in the laboratory. It makes my lesson easier for them to know how to make a PowerPoint presentation (T18).

One of these 5 participants emphasized the necessity of computer teachers in schools. Because he believed that in this way the students could learn the effective and appropriate use of technology.

When there is an IT teacher in a school, students learn how to use the computer, how to avoid harmful content, what to be careful about while wandering around social environments like Facebook, what they can develop with the help of a computer, what they can do with it. This is what really means to use a computer. Using a computer doesn't mean to use a keyboard or clicking the mouse. For this reason, there should be an IT teacher (T21).

One of ICT teacher claimed that the course objectives specified in the textbooks were not appropriate for the students. For example, she stated that it was not appropriate to tell the 9th grade students about how a computer would be turn on and off. A computer teacher at an elementary school said that she taught some topics that were not in the curriculum upon consensus among teachers. She explained that they could teach programming by taking joint decisions with other teachers in order to gather attention of the students to computer lessons. Another computer teacher at a high school also found the content of the courses very basic.

> *I don't find the course subjects and the curriculum much appropriate, they are so basic. It's talking about turning on and off a computer. Now the kids are already in technology age, they already know it. I think the subjects are very simple (T9).*

4.3.1.1.3. Responsibility of Teaching ICT Skills

Responsibility of teaching ICT skills referred to individuals who would be responsible for teaching core ICT skills at school. In Finland, since there were not an ICT specified teacher available in the schools, they claimed that it was the responsibility of each and every teacher there. Each teacher were responsible of ensuring that the students in their class would reach a certain standard level of ICT competency, even if they had different level of ICT competency at the beginning of their class. The teachers who were more interested in ICTs were also more involved in the process of ICT integration into education, however this didn't change the responsibility of other teachers.

In S. Korea, there were different practices emerged related to ICT education. Homeroom teachers, other subject teachers, technology teachers if there was any, teachers of afterschool and private institutions helped students to gain ICT literacy. Some participants also thought that students could learn it on their own since there was a well-developed technology infrastructure available in S. Korea. Homeroom teachers were primarily responsible of teaching core ICT skills. But other subject teachers would also help students to acquire the skills. If there was an ICT teacher at the school, he would also be primarily responsible of teaching core ICT skills. However, not all schools had an ICT teacher in S. Korea. Moreover, these teachers were not always graduated from an education faculty. They were sometimes graduated from science and engineering faculties. Some teachers pointed out that teaching ethical use of technology were their primary concern rather than teaching how to use it.

In Turkey, primary, elementary and high schools had a different approach against ICT education. Since there was neither a course regarding ICT literacy nor a computer teacher in primary school, classroom teachers were responsible of teaching ICT skills. There were also project and club activities rarely held. In elementary schools, ICT teachers were primarily responsible for teaching core ICT skills since there were mandatory courses. In high schools, ICT related teachers were mostly focused on providing technical support for the FATIH project rather than providing variety of ICT related courses. They were not also necessarily graduated from computer teacher department, but they could be assigned to this position with the help of their certifications. Only one participant stated that subject teachers may help students to learn more about technologies. On the other hand, some teacher thought that students were able to learn how to use technologies on their own since they already came to schools with their ICT competencies.

Finland

Most of the Finnish participants (n=15) indicated that bringing the core ICT competencies to students were the responsibility of each and every teacher. They also mentioned that since there was not an ICT specialized teacher in the schools in general, all teachers had to contribute to ICT skills acquisition and improvement of competencies of the students. Here again, there was an emphasis on the integration of technology into lessons. As they mentioned before there was no ICT specified teacher in the schools in general. Thus, classroom and subject teachers were teaching basic ICT skills to students throughout learning and teaching process:

> *All the subject teachers should teach them. We don't have ICT teachers. The ICT teaching is integrated in all the school chapters (F5).*

> *We don't have any subject matter teacher for ICT. Every classroom teacher teaches the core ICT skills. It is inside of every subject (F10).*

Some of the participants claimed that the student's inability to use ICT did not prevent the teachers from using ICT. Because they said that it was a duty of the teacher to help the students build up this ability in anyways possible.

> *Students' ability to use ICT doesn't affect my use of ICT in the classroom. I can't find any kind of effect, it is my work to teach them… Teachers teach core ICT skills to children. It is like a chain: Computers, teachers, children. In the chain, the weak circle is the teachers (F6).*

Some (n=3) further discussed that when students had different level of ICT competencies at some point of their education, the teachers had to ensure that all students acquired a standard set of skills regarding ICT in their class.

> *There is big differences among student's abilities of use of ICT. Some knows more than I do and some doesn't know anything ... We are trying to teach certain level, but not equal level. If students want to, they can learn advanced level. But they must have some basic skills…Their teachers are responsible for the acquisition of these skills. Every teacher should test their students' skills… In the low level grades, every teacher who uses technology in the classroom teaches how to use them. In every class they go, the teachers also teach how to use ICT. They learn every time if there is something new (F18).*

In some schools, there were one or more teachers who were assigned as an ICT teacher in Finland. They were not necessarily specialized in ICT, but they were highly interested in technology and its applications. In the schools where ICT-like teachers were present, naturally these teachers were more involved in ICT education. However, the presence of the ICT-like teacher did not prevent other teachers from supporting the process of developing the ICT skills of the students.

A principal shared his thoughts about students' acquisition of ICT skills. He stated that he is in favor of adopting an advanced pedagogical approach in order to develop the ICT skills of the students instead of just spending all the allocated budget for the purchase of technological devices.

> *We are getting some money from Education Ministry, like 50.000 Euros, and we have the project whose name is "Creating the schools of the digital age". We would like to develop the 21 century skills of the pupils….We would like to do different things which support the development of the skills rather than only buying machinery. I think that it is based on the pedagogy like collaborative learning by designing, thinking and more and more inquiry learning. Because we should think pupils as producers not like consumers that are filling empty lines in the workbooks (F12).*

S. Korea

13 S. Korean participants shed light on this issue. There were different practices emerged related to ICT education. Homeroom teachers, other subject teachers, technology teachers, if there was any, teachers of afterschool and private institutions helped students improve ICT literacy skills. Some participants also thought that students could learn a lot on their own also. 7 of them stated that homeroom teachers generally taught ICT literacy through creative experiental activities. In addition to homeroom teachers' being responsible for developing ICT skills of the students in some courses, all other teachers also contributed to the ICT education of the students.

> *All the teachers are responsible to teach ICT literacy (K9).*

> *Practical Art lessons in school provide knowledge regarding ICT literacy at grade 5 and 6…There is no teacher in charge, but basically all teachers have the skills to teach… We support utilization of internet information and education of computer literacy skills (K12).*

Interestingly, 3 S. Korean participants mentioned that teaching ethical use of technology was more important than teaching how to use the technology itself.

I think that computer literacy education is essential to advance the future society. I think that it should include the use of computer in ethical aspect beyond computer utilization itself (K14).

In S. Korea, only some schools had a computer teacher. Some of them were graduated from education department but others were graduated from the department of computer science and engineering. Some teachers who had a computer teacher in their school stated that technology and computer teachers would help students improve their ICT literacy skills. 2 S. Korean participants stated that afterschool courses and private institutes also help students acquire ICT skills.

2 S. Korean participants claimed that since S. Korea had a well-developed technology infrastructure, students could learn ICT subjects of skills on their own.

For the structure like the environment, S. Korea is really well-developed. We have internet and Wi-Fi and stuff everywhere. So, we as teachers don't have to really teach this things to students. Because they already learn by themselves at home, outside of the schools. I think what the good thing is that we are at the changing phase. Even the teachers try to become open minded. That's the point, the students already know well and they can learn themselves (K2).

Turkey

11 Turkish participants commented on this issue. Primary, elementary and high school had different approach for ICT education. Since there was neither a course regarding ICT literacy nor a computer teacher in primary school, classroom teachers were responsible of teaching ICT literacy. There were also project and club activities rarely held. In elementary schools, there were computer teachers as the requirement of the presence of compulsory IT courses. For this reason, the participants who were working in an elementary school at that time stated that the computer teacher would teach basic ICT skills and literacy.

Computer lessons were classified as elective courses in high schools. Thus, the computer teachers could also be available. However, they were not necessarily required to be graduated from computer and instructional technologies or relevant departments. For example, one participant claimed that their computer teacher was a home economics teacher, and she got the position with the help of her computer certification program. He further noted that if she was originally graduated from computer and instructional technologies or relevant departments, she could be a more effective teacher in this field.

> *We have a teacher, but she's not a computer sciences graduate, to my knowledge, she's a home economics teacher. She took her pedagogical formation training on computer technology by attending to a course ... In terms of background information, a teacher who studied that subject for four years and a teacher that gained a licence later over some trainings would differ. The productivity of a person that had dedicated his four years to this profession would be much more different (T3)*

Other 2 high school teachers highlighted that the computer teachers in the high schools mostly took care of the hardware, software and infrastructure issues and requirements regarding Fatih Project rather than focusing on ICT education of the students itself. One of the high school teachers also pointed out that the subject matter teachers at the schools where the FATIH project was implemented had the knowledge of how to use provided technology, so they were able to inform students about ICT literacy.

> *Subject matter teachers only clean up the viruses and format the smart boards. And in addition, they warn the children about that some websites are unfavorable, and in their own classes, they inform children about how they can use the computer consciously (T5).*

4 of the participants indicated that the students already had the basic ICT skills prior to their technology school education and teachers were only able to make small contribution to their knowledge. One of them said that the technology was frequently used in everyday life so this would facilitate an easier integration of technology into education. Other one claimed students could learn how to use technology on their own.

> *The students come here with the previously gained skills, they do not need to be taught anything, and they already have the knowledge. Can we say that a significant addition is made to their knowledge here? I don't think*

so because they already know the things we are supposed to teach them here (T3).

I think the children have the facility to computer use and the computers are commonly integrated to our daily lives. And for technology integration, the most important factor is that it is a part of our lives I suppose... And I believe it is a part of the education too. I mean it is inevitable (T12).

4.3.1.2. Reasons of ICT use

"Reasons of ICT use" explained why teachers preferred to use ICT tools in their lessons. One of the reasons was affordance of the technology including learning experience enrichment of the students, instant access to limitless information/material, encouraging collaboration and communication, and enhancement of visualization. Another reason was that technology as a tool could diversify the learning and teaching methods. The last reason emerged was technology being a motivator for the students.

While the emphasis on visualization was only appeared in the case in Turkey, Turkish participants didn't mention any reason such that the technology was encouraging collaboration and communication. While S. Korean and Finnish participants claim that use of technology enables the creation of different instructional methods, Turkish participants underlined that it diversified the means of delivering content, and helped them make abstract concepts seem more concrete.. Turkish participants stated that by diversifying the means of content delivery, they kept a goal of enhancing knowledge gain and enabling permanent learning for the students.

As S. Korean and Finnish participants did, the Turkish participants also drew attention to ICT stating that it was only a tool to realize teaching and learning purposes and it should be only used when required in order to meet the needs of the students and should be kept aligned with the course objectives. Only Finnish participants suggested that they would try to use the new technological devices and tools and figure out whether it would be beneficial for the learning process first. And then they would decide to integrate it in their classes to enhance the learning of the students. In each case, technology use was thought to improve students' motivation in learning.

4.3.1.2.1. Affordances

In this context, affordances referred to the actions enabled by the technology available in the classrooms. For example, in this study, four main actions emerged in total as the affordances. The technology was utilized, because it afforded to enrich learning experience of the students (F, K, T), provide instant access to limitless information and course material (F, K, T), encourage collaboration and communication (F, K), and enhance visualization (T). The capital letters in previous sentence referred to the participant of which country commented on the related actions.

In Finland, the participants referred to affordances as enhancing the learning experience of the students, providing wider range of educational materials and extensive information online, enabling collaboration and supporting collaborative learning. S. Korean participants listed the affordances as follows: Enabling the understanding of difficult/new concepts, displaying dangerous experiments online to students, which couldn't be conducted in the classroom environment, providing authentic learning resources and unlimited information, and improving students' collaborative abilities. Enhancing learning experience of the students, display of dangerous experiments that couldn't be conducted in the classroom environment, quick access to a lot of information and resources through technology, and visualization of abstract concepts or to making their lessons more visual were the affordances that Turkish participants mentioned.

Enhancing the learning experience of the students with the help of technology was the main focus in each country. The participants from all three of the countries also pointed out that technology provided access to a wider range of educational materials and extensive information online. However, improving students' collaborative abilities through technology use was only mentioned by S. Korean and Finnish participants. Visualization of abstract concepts or making their lessons more visual was the focal point of Turkish participants.

Finland

In total of 10 Finnish participants stated that they preferred to use technology in the classrooms due to its affordances. In the case of Finland, these affordances included providing instant access to limitless information and course material and encourage collaboration and communication in particular. 5 Finnish participants highlighted that the technology use could enrich the learning experience of the students since technology could offer a wide range of learning and teaching tools such as visuals, videos, and subject-related documents:

> *I think with ICT you can do things that you couldn't otherwise. You can show things to children as well. For example, with the 6 graders the stories are often about Australia or the USA or the places they haven't been to. In different countries and different part of the world, they don't know what it is like to live there. I try to find some material on the internet and we have a look at a video on how is it like to live in Australia (F11).*

6 Finnish participants indicated that using iPads, internet or smart phones could provide wider range of educational materials and extensive information online. Some participants pointed out that the students were able to access the most up-to-date information quicker and easier than searching through a textbook.

> *The information is massively big at the moment comparing the books. If you have only books, there are 2-3 pages information related to the specific subject. But if you have IPads, you can reach more information online (F18).*
>
> *It is much easier to find out subjects or get information rather than searching in the book (F19).*

5 Finnish participants pointed out that the technology use could enable collaboration and support collaborative learning. In this way, they expressed the belief that the use

of technology for collaboration could provide an opportunity to enhance the interaction between classmates and instructors.

> *The education system should be based on more inquiry learning. We should support more and more collaborative learning by designing. This is mainly my understanding of ICT, it can support things like that (F12).*

> *…What I do for my classes is to learn the ways of how people learn the way of interaction via social media/computer/videos/phones or how do they work and collaborate together with some ICT tools…I mostly use tools that will improve the interaction/communication between students, tools to teach the students how to interact as a responsible adult via social media (F5).*

S. Korea

11 S. Korean participants commented on this issue. Particularly 2 of them mentioned that they utilized technology when they wanted to help students to gain understanding of difficult concepts that could not be understood without practicing or experiencing:

> *I think that it helps to teach things that you would not experienced yourself with the help of the teacher's explanations (K19).*

> *Not always, but I need to present something authentic to the students while I teach. Also I sometimes need to rely on the videos when my students can't have a chance to practice (K7).*

A few participants (n=3) highlighted that they used technology in order to watch and understand the dangerous experiments that couldn't be done in the classroom environment, where it would be safer to reach the necessary goal with the help of technology. Other 3 S. Korean participants emphasized that authentic learning resources and unlimited information could be reached with the use of technology, not only in class, but from everywhere. Lastly, 5 S. Korean participants indicated that technology use could improve students' collaborative abilities. One of them also further noted that the technology use could enhance communication amongst students and teachers.

> *It is helpful to improve students' collaborative ability… Some teachers utilize the technologies for collaborative learning and communication with students or their parents (K10).*

> *It can enhance communication in between teachers and students (K8).*

One of them explained that she utilized commonly known social media apps used by the students outside of the school in order to facilitate communication amongst students:

> *I use Kakao Talk or BAND (popular social app in S. Korea). Band is like public grouping (BAND is a mobile community application that facilitates group communication). There are many groups and they send SMSs. Students use this in classrooms or last year classes with new or old friends. Some students use it for fun clubs of idols. Students think that these applications are familiar to them, so I can use them for academic purposes… It is developed by NAVER. It is very useful. Because, students already have NAVER ID (K3).*

Turkey

15 Turkish participants commented on affordances explaining their reasons to use technology. 6 of them expressed that they were able to enhance learning experience of the students with the help of technology use. For instance, they claimed that learning with technology provided a better understanding of the subject by making the concepts more visual and allowing students to practice more than once. However, according to other participant, technology use was only suitable for reviews, but not for teaching a brand new concept for the students:

> *The use of technology is good for repetition of the subject, but from there nothing is taught from scratch. First of all, it is aimed to attract students' attention, write important things on the board, and then in order to reinforce, we should repeat it with the children from the smart board through this website to see what has been given on the subject (T5).*

Their focus was mostly on helping students gain an understanding of abstract concepts through videos, simulations, visuals and animations. For example, one of them explained that when she was teaching quantum which was such an abstract concept, she felt the need to get help from technology. A social science teacher expressed the belief that social science lectures needed to be enriched by only visuals due to the nature of the lesson. She further noted that social science lectures were not like math and it would not require that much of a technical knowledge of technology.

Some of them (n=3) also further noted that, via software, video and online sources, technology use allowed them to do the experiments that were not appropriate to be conducted in the classroom. This was another way to enrich the learning experience of the students:

> *It helps us explain abstract concepts by means of concrete…. Apart from that, we no longer need to conduct experiments in the laboratory because they can be done actively on some of the websites on the smart board. For example, we are watching the experiments from there, the teacher does and explains the experiment (T5).*

> *I think it is very important and necessary for not only the 1st grade but for all grades, to enable a more active class and make students gain knowledge more easily. For example, for the 4th grade, where the schedule is very busy and it is not very possible to do most of the experiments, it enables children to do and watch a lot of experiments (T15).*

Some Turkish participants (n=5) indicated that they liked to utilize technology in the classroom, because they were able to quickly reach a lot of information and resources through technology.

> *Access more resources, more types of questions, and capture different perspectives (T4).*

> *It makes everything easier. In terms of learning, in terms of wealth of information… Even though the students come prepared, we are still able to make up for their shortcomings immediately or if there is any false information, we are able to correct them immediately. In this respect, it gives us speed in accessing the information and in learning (T7).*

Some participants (n=4) emphasized that the use of technology saved time in the teaching and learning processes. Immediate access to information, immediate feedback, and quick delivery of the content were what helped the teachers save some time during the lessons.

> *Technology use is more efficient in terms of time saving. It can be more impressive because it is visual and it can be more boring if it is always monotonous. It is required to use all items such as pictures, videos, audios as a combination; it is more effective this way (T1).*

> *I use it to diversify the lesson, to motivate the students and to save time. The advantages of it [the technology] are to save time, to access information immediately. It allows children to focus, while presenting the information in a flawless and best way, you can present it in a different way. But after a while it can consume the teacher if it is used too much (T12).*

3 Turkish participants believed that technology use increased the speed of the course. For example, in high school, especially in mathematics, it is stated that technology could increase the number of questions solved in a period of single class. However, one mathematics teacher in a high school pointed out that solving more questions with the help of technology may not necessarily increase the success of the students.

> *It facilitates the teaching process of the course, but I don't think it facilitates perception. We go over a lot more questions and solutions in mathematics, but success does not increase in the same way. Solving a lot of questions does not increase the success along with it. Sometimes we can even reach some high-level analysis and synthesis steps and the goals and objectives to be reached with the support of this information technology, the level remains low (T4).*

Interestingly, only Turkish participants specifically drew attention to visualization property of technology. 11 Turkish participants claimed that they liked to use ICTs for visualization of abstract concepts or to make their lessons more visual in order to help students to understand the subject better.

> *The main reason for me to use technology is to compensate for the parts where I feel inadequate to explain or at times when I think that it would*

be better and more effective to visualize it. I mostly use technology when I need visuals (T6).

It is required to support the lessons with visuals in order to give a better quality education and make children understand the subject better for sure. And technology use really helps us in that context (T20).

4.3.1.2.2. Diversifying Teaching Methods

Diversifying teaching methods referred to the effort to create various instructional methods with the help of technology in order to foster learning in the classroom. The participants indicated that using technology would diversify the teaching methods available. Most of them indicated that the technology was supporting teachers to realize their course objectives. Diversification of methods with the use of technology was also diversifying ways of learning of the students.

In Finland, the participants thought that technology use could alter the way of their teaching in a way that it met the different learning needs of the students. Moreover, this could enhance teaching and learning methods and prevent the lesson from being boring. Another point that Finnish participants mentioned was that the use of technology would catalyze and support their teaching, so that it would make their job easier.

In S. Korea, the participants also agreed that the use of technology would diversify and enhance teaching and learning methods. However, their focal point was that the availability of the technologies would increase the number of tools and materials that could be used to facilitate students' learning in the classroom. They believed that delivery of instructions via technology would be more effective and interactive. They also claimed that students' concentration and attention would improve this way.

In Turkey, the participants claimed that the use of technology would diversify the ways of delivering the content and it would help concretize the abstract concepts rather than diversifying ways of instructional methods. By diversifying the ways of delivering the content, they aimed to increase the permanency of the gained knowledge by the students.

Finland

15 Finnish participants indicated that the main reason they liked to incorporate with technology was diversifying and enhancing teaching and learning methods. They used various methods to avoid the lessons getting monotonous. They also further noted that it was also very helpful for meeting the different learning needs of the students.

> *For teachers it is more diversity of teaching; it gives more opportunities to teach…I think I try to vary these tools and these methods and if we have done something last week we don't do it next week, every week we try to put something different in the process and try to use the tools since there are a lot of ways to learn and teach. Sometimes they use software and play and sometimes we use books, pen for learning… I think it also helps teacher's works, you can teach more effective (F10).*

> *I think it gives more opportunity to teach in different ways. For example I don't think that we should have books in biology, because we can go through without books. If I want to use paper, I can copy them and use copies…It gives more learning ways for children. We use what we have… Using ICT in the classroom is one way to teach children and it is also important for us to keep it in our minds that it is not all about teaching, it is just one way of teaching (F14).*

7 of the participants especially pointed out that technology use make their job easier. Teachers could diversify teaching methods and they also could make this process easier with the help of technology use.

> *The use of technology in the classroom improves learning and the future skills of the students. Because they have studied those who doesn't like that much learning and they think it is hard for them to learn so with the iPads it is easier to make something and show to others. I think it helps that kind of students very well (F15).*

> *ICT use in the classroom is something new. I use it to refresh or change the teaching methods… I try to use it as much as possible. I think it makes my job easier. Easier for me and sometimes it is easier for students (F18).*

S. Korea

13 S. Korean participants shed light on this issue. Some S. Korean participants (n=4) directly mentioned that the technology could diversify the teaching and learning methods.

> *In my opinion, ICT use helps me broaden ways of teaching in the classes and I use it frequently… It gives teachers more choices for materials to utilize. A picture is more powerful than a million words. A video can be super powerful when teaching an unfamiliar concept or a new topic (K18).*

But most of the S. Korean participants (n=10) emphasized that the technology could increase accessibility of the tools that can be used for facilitating students' learning in the classroom. In other words, ICTs provided more tools and materials that teachers could choose to accomplish their teaching objectives. The focus was on delivery of instructions via technology more effectively and interactively. They claimed that students' concentration and attention would improve this way.

> *I can teach students more effective and more efficient by using ICT… Traditional classroom instruction has limited delivery tools. In other words, ICT enables using various media in the classroom class (K15).*

> *It provides effective learning and attention gathering… Presenting new ICT tools is a stimulus to many students in self learning (K17).*

Some S. Korean participants (n=5) explained that technology helped them to communicate with their students better. Moreover, they said that the technology use provided more realistic and effective presentation of the lessons and related examples whenever there was a lack of understanding.

> *Basically, students have the curiosity towards technology. Using the technology in the classroom can make them really focus on the lecture that could be really strong point. Classroom can be really active with the communication like sharing, which is supported by the technology. It is not one way teaching, it is interactive (K2).*

ICTs give an effective way of presentation… It helps to make teaching materials easily and present it dynamically… It can enable various teaching-learning methods…I believe the students feel easy to learn when I use ICT tools… It also enables individual learning, simultaneity, authenticity…It can make students' experience more specific and realistic…I hope there are some more specific teaching method of ICT utilization (K7).

Turkey

17 Turkish participant commented on this issue. The participants' comments did not particularly indicate a common statement that they considered ICT as another type of teaching method. No clear statements regarding that technology helped diversifying the teaching methods were made. These participants claimed that they utilized a technology to increase the permanence of students' learning. They thought that increasing visuality of some particular subjects, such as history, diversifying the way of delivering the content, and concretizing the abstract concepts with the help of technology would also improve the quality of education. Some participants indicated that the use of technology supported student-centered learning. The various participants' discourses including these findings were presented below:

When technology is used, students get a better understanding of the issues. They don't forget the things they learn visually. When they see it alive with animations, there is a better and more efficient learning: When it includes games plus computers plus lesson. It is that the child becomes able to see the things normally he can't visualize on his own. In other words, concretizing an abstract concept is the advantage (T18).

I think that the lesson becomes more interactive, more active and more effective when the lesson is taught by using technology... It enables that the students learn the lesson in a more visual way or more effective and productive way. The use of technology in student-centered teaching is very important (T2).

4.3.1.2.2.1.ICT as an Optional Tool

ICT as an optional tool referred to the perception of ICT as a tool to be used when required. While technology use diversified teaching and learning methods, it still should not become the course objective itself rather than being an educational tool. In this context, this code indicated that ICT was only seen as a tool and should be only used when necessary. In total 42 participants from three different countries agreed on this concept.

In Finland, the participants agreed that technology as a tool should be used when it was necessary during the teaching process. They also pointed out that teachers needed to be aware of that the use of technology should not replace the main goal of pursuing the objectives of the course. They also explained that continuous use of technology would cause the loss of students' attention eventually, so it needed to be used in a more balanced way. Needs of students, requirements of the subject and the content should define the technology use. Teachers stated that they would take advantage of trial-and-error approach to decide whether to use a new technology or not in their classrooms.

In S. Korea, there was a strong emphasis on that the use of technology was only a tool and not the purpose of the lesson. Similar to what Finnish participants stated, the S. Korean participants also pointed out that the nature and objectives of a subject would determine the technology use in the classroom. The S. Korean participants indicated that content and objectives of the lesson, and availability of the tools would determine what would be used for delivery of the lesson.

In Turkey, similar to Finnish and S. Korean statements, Turkish participants also drew attention to ICTs' being just a tool for teaching and learning processes only when it was required to use based on needs of the students and objectives of subject. Only Finnish participants suggested that they would experiment and discover a technological tool to see whether it would be beneficial for the learning process, and then they would decide to keep incorporating it in the classroom or not.

Finland

In total, 16 Finnish participants contributed to this code. 13 Finnish participants agreed that ICT was just a tool which was used when required in the classroom. The majority of those who commented on this issue (n=10) expressed the belief that ICT was only a tool for both teachers and students to accomplish their objectives covered in the learning and teaching processes. They claimed that technology use was an ordinary part of the process: the use of technology was no different than using pens and papers anymore.

> *I think that mostly in every lesson there is a time to use ICT in different ways… ICT is just a tool (F1).*

> *I have to say that before we used pen and paper, blackboard, and these were part of the education. It was the way of the doing, sharing and rehearsing things. Nowadays, ICT is in that role. As a tool, way to do things… At the moment, iPad is like book or pen for the students… They see it just a machine. So it is just a machine and just the way of doing things. At the moment, we are updating iPads, so it wasn't a problem for them to leave them in here. It is like a book, they don't mind to leave it anymore (F13).*

In particular, 2 of these 13 participants pointed out that sometimes technology use may turn into a course objective rather than just being a tool. They said that teachers needed to pay attention to this. One of the participants explained that at first, students would show huge interest in a new technology, but after sometime it would become no different than any other tool in the classroom. Thus, the students wouldn't want to use the technology all the time after some point. Another participant highlighted that using the same methods or tools was ineffective after a while. So he emphasized the use of tools including ICTs for a certain amount of time when required.

More particularly 7 participants drew attention to using technology when it was necessary. The focus was on using variety of tools depending on the specific needs of students, requirements of the subject and content. For instance one participant (F1) commented that "I think that ICT is not the master it's the slave and the subject is the master… It is useful when the needs come from this subject and this topic”. The comments below also supported this idea:

> *If iPAD adds extra value for the thing we are doing for example if we need photos then we take the photos and we use them and if we want something written on the wall then we do it by word processing or if they want to find some information on a project then we use the internet so it is just one tool... Nice one but not always the best one, it depends what kind of activity we have (F11).*

> *When it is not possible but when it is necessary or when it's bring something else to the learning process, okay then use technology to enhance something. Not all the time, just when it is necessary we use them… It is not that everything should be done with the computers. It is also important that we do other things also (F2).*

As an extension of the use of technology as a tool in education, participants were also asked to think about their selection process for which technology would be most suitable for the lesson. 8 participants commented on their decision-making process for whether a technological tool would be used or not. All of 8 participants indicated that when a new tool was introduced or when they learned new information about a technology, they would first try and discover if it works for them and for the students in the classroom. Example participant discourses were given below:

> *I try to choose one which is the most suitable. Sometimes it might not work sometimes it might. The same thing as if I want to sing a song or play a music (F2).*

> *If I take the course, I try them in the classroom. If it works, i use them, but if it doesn't work, I don’t use them. Sometimes, I take a break of using a tool or a way, and then it comes up to my mind again and then i use them again….You need to learn by yourself by trying. You must see what or which one works (F18).*

One of them explained that if it worked for them, the teacher would adopt the method as a way of teaching. Otherwise, they claimed that they would keep trying to find the best tool or way to reach objectives of the course.

S. Korea

16 S. Korean participants contributed to this issue. 7 of them stated that ICT should be considered as a tool in the classroom rather than making its use the main objective of the course. The ICTs were seen as one of the tools sometimes used to deliver more effective lessons. The participants pointed out that the focus should be on the process rather than on ICT itself as a tool. One participant said that students and teachers should not to be the slaves to the technology while utilizing them.

> *I always consider how to make my lesson most effective for the students. Accordingly, I decide whether I would use technology or not… Teachers should make sure that the core of lessons are given, ICT utilization is only adjuvant (supportive/assistive) (K7).*

> *ICT is just a tool for me for teaching. It is a device for improving the skills to get the information from the world… I think that device itself doesn't make any students engaged into lessons, but the process (K2).*

In particular, 3 participants explained that the technology use never needed to be a goal of learning process:

> *My main idea is that ICT can not be the main thing in the classroom. It is always supportive for the teaching. I think we don't need to really focus on technology. Students are already use a lot of technology outside of the school… We are really good at using technology, science and math and other things too, but we don't really push students to use technology as a goal (K1).*

One participant further noted that the technology should be used in a balanced manner in the classrooms. However, she also expressed the belief that technology use may not be more common than now in the future, since many teachers were able teach very well without technology anyway:

> *Students think that teaching with technology is fun and very interesting. But it shouldn't be for long time...ICT is like salt in the food. If there is no salt, the food can be okay, but not delicious. If some additional things are added, the food can be more delicious…I cannot be sure that ICT integration would be more general and public in the future. Because many*

> *teachers think ICT is not necessary. Their opinion is meaningful, because they teach very well without technology (K3).*

8 of these 16 participants emphasized that unless the nature and objectives of a subject required the use of technology, both students and teachers wouldn't feel the need to use them. It should be determined whether to employ technology as a teaching and learning tool or not by considering the main objective of the course:

> *I do not think class activity is determined by educational policy, but I think it can be used if necessary when we plan class activities. I try to choose and utilize it when I plan lessons based on the curriculum…. If the best way to implement the objectives is possible by using ICT, then I will utilize it. So, I will use ICTs only when it is needed (K11).*

6 S. Korean participants shed light on how they decided to use technology as a tool. They stated that the content and the objectives of the lesson, and availability of the tools would determine what tool would be used while delivering any content to the students. One of these participants said that she would change her teaching method in order to enable a more effective lecture when the course was not understood clearly. In this context, she highlighted that she would utilize a technology that was based on requirement of the lesson at that point.

> *When I teach some content in the classroom, I feel that there is some deficiency. So I need to teach some more about the contents. Then I find some other ways to teach which is more efficient. So I can select ICT which would fit for the topic at that point (K3).*

Another participant gave the details of her decision-making process for an appropriate selection of teaching tool. Her assessment and selection would be based on accessibility, cost calculations, convenience and suitability to the main educational purpose.

Turkey

13 Turkish participants expressed the belief that ICT was just a tool to be used when required. They also pointed out that overuse of ICT could do more harm than good. 5

of these 13 participants clearly stated that the technology could be only a tool for enhancing the teaching and learning processes. They discussed that even if technology use supported the teaching and learning process, it was not necessary to use it continuously. It would be more useful to use it at learning stages that were appropriate:

> *Technology supports education, but I am not a fan of teaching everything with the help of technology. But I can also say that I am in favor of the use since it is very useful in terms of time management… Something supportive yes, but I see it only as a side element. It should not be a main element in education (T10).*

> *The mathematics questions cannot be solved without writing, I mean the questions are solved upon writing. I believe in that. It's nice to be using this in order to tell a few things. But it is wrong to see everything as they are all about the technology and to assume that if someone knows how to use the technology, then it means he or she knows everything. Because the exams are not closely related to it, this is not how we do the exams (T13).*

9 of these 13 participants indicated that the technology should be used only when required. Some of them highlighted the necessity of avoiding continuous use of technology once again:

> *Without staying dependent on the technology during whole class, it can be used when it is required and then you can go back to the existing system (T7).*

Some participants indicated that it could be decided whether technology use was necessary in the classroom or not based on the main requirements of the course and the needs of the students. One of the participants highlighted that technology was like a puzzle piece that completed the whole picture in education.

> *The use of technology can be thought of as the completion of a puzzle with the missing piece… The plan can be selected and used according to the state of acquisition and class environment (T15)*

4.3.1.2.3. Motivator

For technology use, being a motivator referred to its contribution to the improvement of students' engagement and motivation. A total of 23 people from 3 different countries, said that the use of technology could increase the motivation of students in the classroom. The majority of those who thought this way was formed by Finnish participants. Some S. Korean and Turkish participants also agreed that they preferred to use ICTs in the classroom in order to improve students' motivation. Some Finnish participants also mentioned that the motivation of students to use ICT would enable technology integration.

Finland

12 Finnish participants expressed the belief that technology use in the classroom could provide motivation for students. For this reason, they sometimes preferred to use technology in the classroom. For example 4 participants explained that the use of technology by both students and teachers enhanced the learning process by motivating them.

> *I think the every day use is quiet alright and the children are motivated about it…. I think the ICT is a good motivator for the children to start the learning process. Because when they see the iPad, they are all like: this is going to be nice or something funny or interesting…. Sometimes I try to find good websites that they can go and have some practice so it is a kind of motivation for them (F11).*

> *In some cases the ICT motivates students, so it is easier for them to study, because they are more motivated (F5).*

4 participants highlighted that stimulating the motivation of the students to use ICT in the classroom was a facilitator for the ICT integration.

> *It often makes students very motivated, this makes easer to use ICT in the classrooms (F17).*

1 Finnish participant explained that students' motivation to work with technology didn't only help their learning process but also improved their some other skills:

> *They can make so great and creative shows and books. The books are so nice, students are proud of them. They are willing to show what they have done. When they want to show their work, they gain more self-esteem, in this way, they became more open and ready to give a speech (F13).*

S. Korea

Only 6 of the S. Korean participants mentioned that they used ICT in the classrooms in order to improve students' motivation and excite their attention.

> *I think that the use of ICT in the training process makes the course more effective. It is more fun and increases the motivation of the students. With the use of technology, we are able to make them concentrate on the lesson and increase their motivation (K4).*

1 of them explained how ICT could motivate students: When ICT was used by the students to create their own materials, it mostly promoted students' motivation:

> *I usually use ICT technologies for stimulating students' motivation or creativity. I also use them for communicating with the students and let students make their presentation or report by using ICT for a performance assessment… ICT use made students interested in making digital outcomes including their own ideas. In addition, the teaching materials made by ICT are effective to motivate students… It helps motivate students and manage student's learning progress (K10).*

Turkey

5 of Turkish participants mentioned that they used ICT in the classroom, because they thought it improved students' motivation. The comments of 2 participants on ICT being a motivator were as follows:

> *When I use technology, children are more interested in class, they are more motivated (T18).*

If I can upload a topic to online platforms, they have the chance to repeat at home. Because today's children love tablets and computers more rather than reading books, they find it more interesting and they can be motivated to do what they are required to do. Thus, the repetition will be guaranteed, the topics discussed will be more permanent (T19).

4.3.1.3. Misuse of Technology

The last sub-theme of ICT skills acquisition process was the misuse of technology. Misuse of technology referred to the excessive or problematic use of technology in the classrooms that would cause distractions and disadvantage to the user, the recipient, and others around them.

The technological habits expected from the students did not always appear in the classroom. While a lot could be done with technology, only a fraction of its potential was used. Some teachers from each country were worried about the use of technology skills of the students in terms of educational purposes. The ability of the students to use technology was considered as both an enabler and a barrier for the integration of the technology into education depending on the competency level in technology use of the students. For example, while the students' use of technology for entertainment purposes were advanced, they were not able to use it effectively for educational and instructional purposes as mentioned by Finnish, S. Korean and Turkish participants. Additionally, the participants from each country indicated that students perceived themselves very skilled about the use of technology for education, but their ability were mostly limited to fulfil entertainment purposes.

In Finland, teachers drew attention to that the students mostly would use technology for entertainment purposes. They believed that excessive use of technology in the classrooms would hinder the learning process, interrupt students' focus and face-to-face social interaction. Only Finnish participants mentioned the importance of students' self-regulation over the technology use. They expressed the belief that providing enough freedom to use technology would help students learn self-regulation.

In S. Korea, some participants claimed that students were capable of using technology only for non-educational proposes as Finnish participants did. They also mentioned that excessive technology use could prevent the learner from focusing on the actual content to be learned. Interestingly, a S. Korean participant drew attention to difficulties in teaching moral issues regarding the use of technology. Different than the case in Finland, some S. Korean participants highlighted the existence of technology addiction among the students. Same issue existed in Turkey too.

In Turkey, the participants claimed that students didn't see technology as a learning tool, it was rather an entertainment tool for them. Non-educational use of technology in the classroom was a problem. Non-educational use of technology, the moral and ethical issues of technology use including cyberbullying and research ethics, distractive side of the technology, and technology addiction were listed as issues regarding the misuse by Turkish participants. Some participants believed that technology use could kill students' creativity, because students would copy and paste any content directly from the internet whilst they are preparing their homework or projects. Additionally, some teachers were afraid that the students would misuse the technology and would not able to focus on the tasks they needed to accomplish. Some other teachers were afraid of the loss of control that could arise when students were using technology during teaching and learning processes in the classroom. However, they only complained about students' ineffective self-regulation over the use of their devices instead of suggesting the necessity of teaching self-regulation as a skill as Finnish participants did.

In each country, the ability of students' non-educational use of technology was better than their use of technology for learning activities. Difficulties in maintaining focus on the context while using technology were reported in each country. Only in Turkey and S. Korea, the concerns related to the existence of technology addiction among students were revealed. Some Finnish participants expressed their concerns about the excessive technology use would interrupt students' face-to-face social interaction. Only in Turkey and S. Korea, the moral and ethical issues of technology use were defined as related to misuse of technology. While Turkish participants complained about students' lack of self-control over the use of their devices, Finnish participants expressed the importance of students' self-regulation over the technology use. Furthermore, Finnish participants suggested that providing enough freedom to use technology would help students to accomplish self-regulation.

Finland

10 Finnish participants commented on this issue. Some of them said that the students' use of technology did not go beyond playing games or using social media. Some claimed that inappropriate use of technology may hinder the learning process. They believed that too much use of technology during the day was not appropriate. They stated that excessive use of technology was not good for the students and that was the downside of technology use. Unlike participants in other countries, 6 out of these participants referred to the importance of students' self-regulation over the technology use.

4 of these 10 participants pointed out that students' ability to use technology were mostly limited to entertainment purposes. The knowledge level that the students bare wouldn't ensure that they would accomplish the tasks to be completed. For example, they were able use social media applications or browse on the internet, however they wouldn't be able to use applications like Excel or Word when it came to make use of them in terms of educational purposes. Nevertheless, students thought that they used technology very well for studying and learning. One of them claimed that the students believed that the technology was only for gaming purposes.

> *What they learn is quite narrow. They learn about apps like Facebook. What they really do is using browser and internet but not educational apps like Excel, Word… (F18)*
>
> *They play with computers, tablets and mobile phones but when we work they can do nothing. It is the basic problem…The majority of children*

think that computers are for entertainment only. Who changes the idea is parents, school, and curriculum… It is not entertainment all the time… If they are at school I can't say them that take computers and play games. But if they are at home, they have own computers, their own rooms they plays games. For example there is a girl in my classroom she plays 5 hours for Sunday but she can't work with computers (F6).

Other 2 Finnish participants claimed that inappropriate uses of technology may hinder learning. They thought that too much technology use would interrupt students' face-to-face social interaction. But one participant said that it was not necessary to worry so much, and he believed that everything would be just fine at the end.

Only one participant mentioned that the use of technology may hinder students' learning by causing them lose their focus during the lessons. Some (n=3) claimed that the use of technology may cause students to focus on technology itself rather than the lecture itself.

When it [technology] works, it is fun. It doesn't suit every student. Because they cant concentrate. There are too much thing that takes them away from the subject when they use the internet and search something. You know there is Facebook and things like that. That is big problem…Of course, it is possible to limit their use of technology, but concentrating is also a part of learning process. They need to learn self-control (F18).

There was a distinctive skill that some of the participants had emphasized on only in Finland: self-regulation (self-control). Some participants (n=6) highlighted that the students had to learn how to have an effective self-control over their technology use instead of the teachers' posing prohibitions that would prevent students from misusing the devices.

Students have to learn self-regulation… Self-regulation is the biggest thing that we have to learn during the school period ... Students know that it's their own responsibility. If they use Facebook, its ok for us but they need to know that if they using Facebook during the class, they won't learn. So they have to improve their self-regulation (F1).

I think one very important thing for students is studying, they should study on how to control themselves in using media. If I say them 'put the phones

> *away' they will never learn how to control it. If I let them to use mobiles as they want, they will learn it eventually that it is not for using all the time when the teacher is speaking (F5).*

5 of the participants claimed that if they provided enough freedom to use technology and let them choose the type of technology that they wanted to use in the classroom, these would improve their self-regulation. According to them, that was the way of avoiding misuse of technology. For instance, a math teacher said that he wanted to teach how to solve equations with the help of equation games, however after some time students got bored and started do irrelevant things with the tools such as recording each other's voices. Then he thought that he had to restrict their use of technology. But after discussing this issue with an academic, he learned that restrictions would destroy the self-regulation process. Banning the use of technology was not the solution. He explained the solution to this problem as follows:

> *The solution was that at next lessons I write down on the blackboard that this is the equation and that is the case to focus on. Now you can decide yourself what kind of software or applications you are using, you can do whatever you want, but the focus is on here. And that changed dramatically the situation… I needed set them free but say this is what we focus on (F1).*

Another participant highlighted that students could easily access technology. So, if they think it was necessary to use it in the classroom, he felt the need for giving them some freedom in this regard. Lastly, an ICT advisor as well as a teacher explained that the students should use everything that they thought they needed in the classroom, because this would give an opportunity for them to find the best way of using technology or media that would work for them:

> *My students are such fine young people, that they really understand that they have to use their mobile phones for studying, but I still don't think that it is bad if they send SMS, in the old times they were sending paper notes; it is the same… So, I rather try to encourage the young people to learn and find their own ways to use the media the best (F5).*

S. Korea

7 S. Korean participants commented on this issue. 2 of them highlighted the existence of technology addiction among students. One of them argued that it was difficult to teach moral issues regarding the use of technology. The other one claimed that the students were already addicted to technology.

> *It is hard to teach the moral of using technology and also it is getting harder to prevent addiction of using ICT devices (K13).*

> *Using technology can have disadvantages. Because, students are already addicted to technology. So, I don't know what the better way is (K3).*

4 of them indicated that technology use were affecting pupils' concentration. They said that features provided by the technology could prevent the learner from focusing on the content.

> *Students can be more interested in the ICT tools rather than the content of the lesson when using ICT tools due to lack of attitude… Use of ICT in education could be time-consuming since it needs too much explanation of how to use the devices and also it can cause lack of concentration of students (K15).*

> *The students can lose attention due to the additional functions of ICT devices… Same way to utilize ICT will make students less interested (K7).*

2 participants pointed out that the students' ability to use technology wasn't enough to accomplish necessary educational task. But they could use technology for non-educational activities.

> *Students basically know how to use the technologies but don't know how to use for education. They only focus on games and stuff (K2).*

> *The students want to use technology as they want, not for the math lesson. For example, in the classroom, there are only few students using the internet to see WebTune or internet articles. This is very big barrier, they can't focus (K3).*

Turkey

More than half of the Turkish participants (n=14) had expressed their opinions about misuse of technology. These participants pointed out four main issues regarding misuse: Non-educational use of technology, the moral and ethical issues of technology, technology being distractive, and technology addiction.

6 of them complained that students don’t see technology as a learning tool. The students mostly would use computers and tables to play games, surf on the internet rather than using it for learning. They also further noted that the tablets provided by the government under FATIH project had restrictions to reach certain apps and online platforms. E-textbooks were already available on tablets. However, the participants claimed that these restrictions had caused students to beat the firewall on the tablets, creating a security breach and use them as they wished.

> *Students do not use the interactive board for educational purposes. When the lesson is over, all of them are opening YouTube, talking about which song they should listen to, which video they should watch, or that they should see a movie as soon as they have spare time. There is no effect on the students on the use of the board ... The tablet is now completely used for playing games. They enter Facebook faster, play more various games, and there is no use in the tablets except for that (T4).*

> *The students are only using the tablets for gaming purposes, not for any other purpose. Since the internet access provided by MoNE is restricted, the children are not able to access many websites, they are choosing the way of breaking the password. The tools get out of warranty when they break the password. There are drawbacks and also benefits to it ... There are vast amount of benefits when you use it consciously. But if you don't, the drawbacks can be too much (T9).*

One participant noted that some students would alter the physical integrity of the computer by removing hard drives or other vital components in the break times. This kind of behavior would be a barrier for the ICT integration.

If we are not in the classroom, they go and break the computers. Or they remove the hard disk. This, of course, can be an obstacle. They should know that these belong to school and shouldn't be harmed (T18).

Additionally, as Finnish and S. Korean participants argued that students had technical skills to use technology but not really in terms of learning purposes, some Turkish participants (n=4) also pointed out the same issue. According to these Turkish participants, students thought that they knew how to use a computer or a tablet as a learning tool, but all they really know is just to surf on the internet, play games and use social networks for personal reasons.

We are not trying to teach [how to use] the machinery. For example, I am trying to teach the child about Word. And they say they already know that. But they really don't, there is a lot that they don't know, they just think they know (T1).

Of course the IT teachers must exist. The use of IT is a very important problem, especially in Turkey. The children are able to use the computer at 5 years old, why should we assign an IT teacher, they say. Actually, what they call "being able to use" are playing games, going on Facebook, reaching harmful content, spending time with a computer without knowing what is good or bad… Students think that the smart board is for other purposes, they consider it as an entertainment tool rather than a tool for education, so their motivation may shift easily and they lose focus (T21).

5 participants indicated that sometimes ethical and moral issues arose from students' use of technology. Social networks and cyberbullying, academic honesty and research ethics, and privacy issues were addressed mainly. There were also problems indicated regarding the technology misuse such as accessing harmful content at school environment.

Internet is available in the whole school, there is Wi-Fi, but we do not give its password to the children. Or else, they are constantly being busy with their cell phones... Hall monitor teachers are warned about this issue so that the children won't be able to misuse the smart boards in break times. We constantly check on the children so that they won't connect to inappropriate websites, watch irrelevant movies, especially when there are less courses at the end of the year. Because they even access the websites that MoNE prohibits by breaking its password (T5).

Moreover, students weren't aware of what to share on social media regarding privacy and safety issues of school members and other students. Cyberbullying on social media also existed among the students. This situation necessitated to put up some limitations regarding the use of particular technology in the school, since it would be a factor affecting the educational environment.

> *MoNE does not actually lean towards the idea of students' bringing their own devices to the school since they may be misusing them. Bad things happened in our school last year, like insulting and molestation on Facebook. Some of the culprits were sent to disciplinary board (T18).*

Another issue was that the students didn't tend to adopt honesty and pursue research ethics academically. They would copy and paste any content directly from the internet whilst they are preparing their homework or projects. Some participants (n=3) expressed the belief that technology use could sometimes kill their creativity.

> *It's actually a good thing, but the students' proficiency levels are so low. They all say that they are able to use computers, but none of them know how to use Word correctly, for example, in the simplest way that they can handle their work. They prepare homework, eventually they do research assignments from the computer, and if you could see the assignments they prepare... They take direct printouts from the internet and bring it (T11).*
>
> *I know that computers come with an advantage, it saves us time and we spend less effort and have to think less. But as we keep handling everything with computers completely, we get all lazy about thinking and producing something ourselves. We are producing our own product with the help of technology, but we are gradually losing our fight in this regard (T12).*

7 participants highlighted that students' misuse of technology in the classroom causes them to lose focus and concentration in terms of school education. Students would abuse the right they had to use technology in classrooms by using their phones and smart boards for personal reasons. This would prevent them to focus on their schoolwork. The technology may be functioning as a tool of distraction in this regard. The participants also mentioned students' ineffective self-control over the use of their

devices. However, they didn't suggest the necessity of teaching self-control as a skill as Finnish participants did. They only complained about misuse of the technology.

> *The use of technology can cause a communication gap between the student and the teacher from time to time: The student can entirely caught up in it, and cut off the connection with the class or the teacher ... If the teacher tells the lesson via the smart board, the student can misuse it. They connect to the internet right away with the tablets, surf on different websites, and don't focus on the lesson. Once the students handle a computer, a tablet or a smart phone, using them for the wrong purposes or in a way that keeping their selves distracted from their homework by saving more personal time will be the negative effects of the technology. (T2).*

> *The use of technology is actually good in terms of the lecture, but the child goes online to study, and for example, he thinks that let's play this game, let's do that in the mean time.. And he gets distracted (T5).*

3 participants drew attention to technology addiction of the children. One of them said that teachers tried to raise awareness about technology addiction since they receive complaints about the students are not saving time to study at home.

> *Students sometimes do not use the technology properly. As a matter of fact, I do not know whether this is just the disadvantage of the technology or a disadvantage created by the person itself. For example, I do not spend 24 hours in front of a computer. But there are children who do so, who are surfing on the internet all the time or who are constantly online on Facebook. Parents come and complain about it. There are those who are devoting all their time to it (T6)*

4.3.2. Teacher- Related Aspects

Teacher-related aspects referred to the aspects which the teachers were influenced when deciding whether to use technology or not in the classroom. Teacher-related aspects included teacher autonomy, their personal interest to use technology, their pedagogical approach to integrate technology, their role as a teacher while using technology for educational purposes in the classroom, teachers' resistance to technology use, teacher motivation and teachers' ICT use. Teachers' ICT use also included available content and available time as its categories.

In each country, the teachers were autonomous in their professional work. They would decide whether technology was necessary to use in the classroom. Only in S. Korea and Turkey, the participants drew attention to possible misuse of autonomy: Not to choose the use of technology to accomplish the goals at all. Only in S. Korea, some participant thought that teachers didn't need to use technology in the classroom anymore since teachers and students had a certain level of ICT skills.

Most of the participants from each country agreed on that for teachers to be interested in technology was a main requirement to accomplish technology integration into education. Being interested would stimulate teachers' learning more about technology and make them implement it more often. Only Finnish participants suggested that teachers should be encouraged and given more time when they didn't show sufficient amount of interest in using technology. In S. Korea, one of the participants mentioned the necessity of change in teachers' mind-set for technology integration, because S. Korean education system was teacher-centered. Additionally, sometimes teachers could feel like they were faced with additional responsibility and consider it as a burden when they were not interested in the subject and really willing to do it. Turkish participants reported the presence of uninterested and unwilling teachers as a barrier to technology integration. Additionally, teachers' private life, busy workload and their desire to access to information without any effort were possible reasons of teachers' lack of interest and effort regarding technology use.

The participants from all three countries agreed that it was more important to contribute to the formation of a pedagogical approach in technology use education than featuring the use of technology itself. Turkish and Finnish participants pointed out that the process of technology integration required a change in the pedagogical approach. Finnish participants were the only ones that mentioned that they collaborated and shared ideas, course materials and experiences in order to improve their technology use for educational purposes. Finnish and Turkish participants were open to learning new things from/with students, since they were of the opinion that some students had superior ICT skills. Additionally, peer-learning as an educational practice was employed in Finland. In Turkey, the focus on how to deliver the content via technology was stronger rather than how to make the teaching experience more effective for the students.

Different descriptions for the role of teachers were made regarding technology integration by the representatives from the participant countries. For example, while Finnish participants defined the role of teacher as a facilitator of the learning in the process of educational use of technology, S. Korean participants attributed three roles to the teachers: Guiding the students to gain the understanding of technology ethics, creating tools, and delivering appropriate learning recourses. From the statements of Turkish participants, two divergent and conflicting definitions for the roles of the teachers were mentioned: To facilitate a teacher-centered instructional method with a teacher-dominated approach, and being a guide or a role-model.

The participants from all the countries agreed that teachers with insufficient technical and pedagogical knowledge could show resistance to technology use. Turkish and Finnish participants particularly mentioned that elder teachers didn’t prefer to use technology in their classrooms. Turkish participants linked this situation to mentioned teachers' advanced age and to their upcoming retirement. Additionally, they pointed out that it was difficult to change pedagogical practices for the elder teachers. The same situation highlighted by some S. Korean participants as well. They thought that teachers preferred to stick with their old practices. They did not feel like learning new things since they were thinking their education as sufficient. Only Finnish teachers suggested that favoring trainings and collaboration could solve problems regarding this situation.

Most of the Finnish participants claimed that both the positive feedbacks from the students and their self enthusiasm would contribute to their motivation to use ICTs. S. Korean participants were more focused on teaching how to use technology in the right way, since they believed that the students were often using technology in their daily life already. The motivation of Turkish participants was mainly based on getting positive feedback from students as it was for Finnish participants. However, they also claimed that students needed to learn how to use technology to have a better future as a requirement of this era, so they felt responsible for teaching it to them. Similarly, Finnish participants indicated that they felt motivated to use technology, since they believed that their students would gain the required skills to be successful in the future.

In Finland, collaborative and interactive tools, IPad, Google services and online platforms were used. In S. Korea, internet was used for information search, and reaching out content/materials. Tools used for presentation were commonly employed. Mirroring devices, skype, and broadcast were also mentioned to be used. In Turkey, similar to S. Korea, internet was used for information search and reaching out to content/materials as much as regulations allowed. Smart boards, projectors and laptops were utilized, but not the tablets. PPTs, multimedia materials were commonly used. Finnish and Turkish participants in particular, found available content insufficient in terms of amount, diversity and scope. A S. Korean participant highlighted the necessity of having up-to-date materials and provision of safe and ethical content. In Turkey, technology use in the classrooms was a bit interrupted due to internet censorship and content restrictions applied in the school environment to constitute safety. In S. Korea, a teacher said that teaching with technology did not always help students to solve their exam questions. The common problem mentioned in Finland, S. Korea and Turkey, was not having sufficient time to prepare relevant course materials and use them in the classroom that much. However, Finnish participants thought that even if it took some time to prepare, they would keep using technology. The materials were reusable and it would save time for later.

4.3.2.1. Teacher Autonomy

Teacher autonomy referred to the professional independence of the school teachers, which especially enables autonomous decision making process for them regarding course content and teaching methods. In Finland, teachers had professional autonomy.

Some administrators mentioned that they trusted their teachers' education methods and decisions they made in the classroom. Teachers would decide on whether a material or technological tool would be used while teaching by taking curriculum requirements into consideration.

In S. Korea, the teachers had control and responsibility over their professional work similar to Finnish teachers. However, differently, teachers didn't have to choose teaching with technological tools over alternative ways of teaching since they claimed that the teachers and students had a certain level of ICT competencies already and they did not actually needed to be taught technology use. In this context, one participant drew attention to a possible misuse of autonomy. Additionally, he claimed that the autonomy of teachers in technology use resulted in a bad outcome, since it brought the freedom of choice instead of enforcing the technology use. Teachers became able to choose between using and not using the technology in the learning and teaching processes.

In Turkey, the teachers were able to make autonomous decisions about how they teach in the classroom similar to Finnish and S. Korean teachers. Teacher's approach and judgement would define the technology use since there was no regulations and policies enforced by curriculum or management. Interestingly, just like in S. Korean case, some Turkish participants were worried about the misuse of autonomy. They explained that the autonomy could lead the teachers to continue with their old teaching methods that they were used to implement. So, autonomy of teachers could hinder technology integration to some extent. Another interesting point was that some participants stated that the availability of technology didn't mean that it would be used. For example, the technologies were available in the classrooms due to FATIH project in Turkey, but nobody knew how much or how effective they were used.

In each country, the teachers were autonomous in their professional work. They would decide whether the technology was necessary to use in the classroom. Only in S. Korea and Turkey, the participants drew attention to possible misuse of autonomy: Not to choose the use of technology to accomplish the goals at all. Only in S. Korea, some participants thought that teachers didn't need to use technology in the classroom anymore since teachers and students had a certain level of ICT skills already.

Finland

12 Finnish participants indicated that Finnish teachers were very autonomous in their professional work. They reflected that teachers' professional autonomy allowed them to have a high degree of control over their classroom activities in the teaching and learning processes. They would make their own decisions while choosing the contents to be delivered, methods or tools to be used. The use of technology in class was a component that the teacher needed to decide whether to take advantage of or not. A principal explained:

> *Teachers can choose if they use ICT or not during their lessons. We have very autonomous teachers. For example, the board of education or principals don't say that "you must use ICT!"… We don't have any systematic strategy for that purpose. It depends mainly on the teacher, and on how he/she enhancing the teaching and learning activities. There are some teachers who are very active and some teachers who are not so active in the using ICT. It depends on teachers (F3).*

Another principal (F7) also further noted that teachers would know what was the best thing to do in the classroom because they already had the required educational background. He claimed that their master degree would help them to make the right decisions: They do not need to get permission from anywhere to apply their own decisions. Teachers were aware that they were in control of their work. 9 of the participants clearly stated that although alternative methods and tools were available to meet the objectives of the lecture, it was up to the teachers to choose the means of technology use to accomplish the goals.

> *Teachers can do what they want in the classroom. Of course objectives are written on the curriculum, but teachers can choose how to teach… We don't need to ask about ideas, teachers can do anything they want in the*

> *classroom, and we don't ask for permission…We decide ourselves based on what fits best for the purpose (F4).*

In this case, teachers' autonomy was limited to the requirements of the curriculum. In order to fulfil the requirements of it, teachers' practice was tied to their choices of teaching philosophy and tools. The flexibility of the curriculum gave teachers the power to do so. For example, while one of the participants commented that "nowadays curriculum is flexible, I can use if I want to, and it depends on me" (F19), the other one stated that "I am a classroom teacher, I organize my own lessons and how to teach and also take responsibility for that, so I take decisions how to teach with technology" (F6). Additionally, other two participants explained the relationship between curriculum and their control over teaching practices. One of them was as follows:

> *We have a national curriculum, the goals of the education are not different but we have a lot of freedom for pedagogy in our classes. We are differently equipped and we have much more freedom to choose how I want to do this… In my classroom, a big deal of the lessons is held by the teachers or by the teacher trainees. I cannot always make them use if they don't want to use ICT and they don't have to use ICT. I could try to say that you could try this if you want to… Of course, the teacher still stays important. Because you have to decide what you are going to use, how you are going to use, when you are going to use and of course as I said before you can change your way of teaching (F2).*

S. Korea

Not different than Finnish participants, 10 S. Korean participants also indicated that they had control and responsibility over their work. They explained that they could plan and select the activities or tools to be employed in order to accomplish objectives of the lesson within the boundaries of curriculum. For example, 5 participants pointed out that the administrators left the decision of how the lesson would be conducted to the teachers. The judgement of teachers for technology use was determinative:

> *I design my lessons with ICTs or without ICTs and it does not affect administrators. Because lesson planning is the own territory of teachers if it is still in the boundary of national curriculum (K13).*

At my school, there is no special policy on the use of ICT. It's completely optional to individual teachers whether use it or not…There is no pressure on me since it is completely optional… I think it relies on each teacher's judgment (K18).

Interestingly, 2 participants claimed that there was no need to set regulations or force teachers to use technology in the classroom anymore. One of them stated that there were regulations 5 years ago, but today there was no need for a regulation to enforce technology use since everybody could use technology: So teachers could decide whether they would like to utilize technology or not in the classrooms now. Similarly, the other participant also highlighted that middle or high school students already knew how to use technology, so there was no need to force teachers to use technology in the classroom. In this context, the decision of technology use left to the teachers.

5 years ago, it was in the regulation book for the teachers, at least 10 %. But now, we feel okay without that 10%, so we can really do whatever we want. That percentage is meaningless to us. Because it all depends on the teachers. Teachers individually decide what to do in the classroom (K1).

Additionally, 1 participant in particicular commented that teachers who were not interested in using technology could not be forced to use it in the classroom in S. Korean System. He further noted that the autonomy of teachers may sometimes result in a bad outcome. As such, the autonomy allowed teachers not to choose to use technology ever in some cases.

In S. Korean education system, you cannot force the teachers to do things if teachers are not interested in technology. The teacher himself owns the right of doing his class. That also could be the good benefit of education system but also it could be really bad problem here. I think that for this part (technology use), it is working very badly (K2).

Turkey

10 Turkish participants also indicated that teachers were able to make autonomous decisions about how they teach in the classroom, as it was same in

Finland and S. Korea. Administrators would not check whether technology was used in this process or not. It was all under the control of teachers:

> *Teachers are trying to implement new technologies. They can use it as they wish. School principal can not just go to class, open the EBA and say teach the lesson from here, the school administration can not interfere with how the teacher will tell the lesson. Teachers determine this according to their lesson plans, imagination and teaching methods. Whether or not to use technology is the teacher's own decision, his own thought. (T21)*

3 participants pointed out that there was neither a description of ICT use in the curriculum nor a policy that was enforcing its implementation. For this reason, they indicated that some teachers would incorporate technology in the classroom less and some would do it more than the others. The teacher's discretion would define the technology use.

> *There is no definition of the use of technology in our curriculum. It is usually up to the teacher's own initiative. So there's no pressure. Teaching is something about inner conscience. So if I just shut the doors and didn't really do a lesson, no one would come and say, "Why didn't you do your job?". In the end, we are trying to figure out how to prepare something better for children (T18).*

One of these 3 participants also highlighted that the technology was accessible in the classroom environment within the context of FATIH project, but that may not necessarily require teachers to use these tools: Teachers would still be the ones to decide whether to use the technology or not.

> *In fact, everyone can use it as they wish, it may be appropriate for every lesson, as long as people want to use it. There is nothing in the curriculum about how the technology must be used. For example, we have an annual plan, according to the curriculum, we distribute the subjects within the annual plan. We have to finish this in a year. It is up to us whether we continue with the textbook or we use technology instead. Within the scope of the Fatih Project, these technologies have been placed into classes, but nobody is actually testing if they are used or not. It is up to us to use them or not (T5).*

Some Turkish participants (n=4) complained that autonomy of teachers could affect the technology integration adversely. They explained that the autonomy could cause teachers to stick with their old teaching methods that were mastered by them. The autonomy did not require teachers to change their practices unless theachers wanted to do so.

> *Teachers are sticking to their habits so far, for example, they have no tendency to use computer laboratories. There's an English teacher, for example, I've never seen him ask for permission to use it [computer laboratories]. I am really surprised at how he is able to teach the lesson, he is only going over the book. Other subject teachers do it. It's up to the teachers' own preference (T11).*

4.3.2.2. Personal Interest

Personal interest provided an insight regarding how the personal interest of teachers in use of technology affecting adoption and integration of the technology in education. Most of the participants from each country agreed that for technology integration, teachers' interest in technology use were primarily required. Teachers' interest would trigger them to learn more about technology and implement them.

Finnish participants defined the interest of teachers in ICT use as one of key element for technology integration. Finnish, S. Korean and Turkish participants indicated that the personal interest of teachers could determine their ICT use in the learning and teaching processes. The participants from each country expressed the belief that the teachers who were more interested in ICT use would promote technology use in the classrrom and those ones would be more encouraged to expand their knowledge regarding technology use. Only Finnish participants suggested that encouragement and time were needed to be provided for the ones who didn't have enough interest to use technology.

In S. Korea, one of the participants mentioned the necessity of change in teachers' mind-set regarding technology integration, because S. Korean education system was teacher-centered and this affected the process a bit negatively. Additionally, sometimes teachers would see learning something new as a burden since they were not interested in the subject. Turkish participants defined the presence of uninterested and unwilling teachers as a barrier in front of technology integration. Additionally, teachers' private life, busy workload and their desire to access to information without any effort were possible reasons of teachers' lack of interest and effort.

Finland

18 Finnish participants indicated that personal interest of the teachers could determine their level and way of ICT use in the learning and teaching processes. The participants from Finland accepting interview requests were the ones who were already into technological and pedagogical aspects of ICT use:

> *I am a classroom teacher as my major subject. Then, especially the use of technology and development of technology in school are my other proficiency that comes after my main job description. It is something that I put a lot of energy into…. It is easy for me to find a way to use technology in the classroom, because I am interested and used to that (F2).*

Since they defined their interest towards ICTs as a hobby, they stated that they like to find new ways of teaching with the help of ICTs. They stated that they were naturally drawn to learning and teaching activities involving the use of technology:

> *I was interested in …I like it, it is like a hobby for me. I love to learn new things, and how to use in the classroom like these flashcards. I didn't use them before, I just see them in the training last week. It will be good to learn geometrical terms by using this. I have decided to use them (F4).*

> *It is personal interest. If you do more, you learn more and then you can share what you have done. Also i use i-pad quite a lot and i read blogs. Moreover, i am in a group in Facebook, I can get some reviews (F13).*

Some of the participants (n=6) pointed out that their personal interests motivated them to put effort into learning and exploring new ways of ICT use for educational purposes. This interest also encouraged them to learn more relevant practices and gain more knowledge. The following participants more clearly indicated that how much they know about ICT use in relation to education depended on them, their interest, and their individual effort:

> *I think that the most important thing is that the teacher himself/herself must be eager to learn by themselves. It is not compulsory for every teacher, because they hadn't got any course related to ICT while they were studying… Government does support some trainings, but not very much. If you are eager, you can go to the course, but if you are not so eager to learn, you don't join… I had to do it by myself, I have these equipment at home (F16).*
>
> *It is up to teacher. If teachers are interested, they go and learn…. If they want to learn something new, they go to course and take it and they apply. If it works, they keep using it…. You need to be motivated, because some people (students and teachers) are allergic to use computers, they are afraid to use it. You have to be motivated and believe that it won't break, and try (F18).*

One participant pointed out that the interest was key point for technology integration, because it was easy to encourage willing teachers to incorporate technology in classroom. He commented that "The easy part is how to encourage those teachers who are interested about ICT. But another thing is how I am able to encourage those who are not interested" (F7). The use of technology by teachers who had personal interest in using technology didn't mean everyone was interested in it and using it. For example, a principal (F16) indicated that not everybody in his school was eager to use technology. Lastly, an ICT advisor pointed out that some teachers who may not have interest in technology, needed encouragement and time to take the first step to utilize technology more than attending trainings and professional development courses.

S. Korea

15 S. Korean participants contributed to this code. They indicated that the teachers who were more interested in ICT use would be more likely to utilize technology in the classroom. For example, they provided examples of their experiences regarding the relationship between their personal interest and technology use as follows:

It is hard to adapt the tools in my class when I only hear how to utilize it in the class from other teachers or teacher training courses. I can integrate the tools more when I'm interested and learned how to use by myself (K11).

I don’t feel any pressure to use technology. If I am interested in it, I can try various ways of teaching method. However some teachers who use e-textbook mandatorily feel pressure, because they don’t know or are not interested in different teaching methods (K7).

One participant explained that since there were many different individuals in the teachers’ community, their willingness to use technology would vary. In his opinion, it was not very possible to achieve an extensive use of technology among teachers, because every teacher had a different personality and each one of them adopts a very different approach against technology use.

Interviewer: Government tried to bring smart education. However, when I visited many schools, I didn’t see much implementation. Also, you don’t use it as much. So, how do you think that this will be extended to all over the country?

K6: Yes, you are right. Because, there are many teachers and they are not same. Some teachers really want to use ICTs, but some teachers don’t (K6).

Additionally 6 of these 15 participants pointed out that if teachers were interested in how to use ICTs in the classroom, they would try to learn or take relevant courses. For example, a participant (K18) noted that the interest in using technology in the classroom was similar to some teachers taking workshops regarding ICT education more than others due to their different interests. Another participant emphasized that technology integration in education would be only possible if teachers were willing to change their mind-set since S. Korean eduction system was focused on teacher rather than student. He further added that teacher willingness to use ICTs would have a greater impact on ICT use in the classroom than infrastructure related conditions.

I haven’t taken use of ICT related education. It is only my interest… Once again, %10 is meaningless right know. But S. Korean education structure

> *itself doesn't really focus on students. It only focuses on teachers. If the teachers decide to change something or they really want to improve their techniques, it will be changed. So, mind-set of teachers would enable technology integration… I think it comes from being open minded towards education itself. Teachers also should think it can be important to try and add just some new techniques in the classrooms (K2).*

Lastly, one participant (K4) claimed that some teachers tended to consider the need for learning new systems as a burden if they were not interested in technology.

Turkey

In total, 15 Turkish participant provided information regarding the relationship between teachers' interest in ICT and their technology use in the classroom. Some interviewees argued that the technology use in the classrrom depended on teachers' interest and teachers' desire for self-improvement, while others complained that the presence of uninterested and unwilling teachers made integration difficult. 9 participants indicated that teachers' personal interest per se could determine their educational ICT use in the classrooms by motivating them to improve their technology using skills and adopt pedagogical approaches. Following comments showed that personal interest of teachers could promote technology use in the classroom.

> *I think that the use of technology in courses creates positive results for the children, but I think that they should enrich their knowledge a little bit and use it. It is important that teachers are interested. I want to use technology in the classroom because I have an interest in this subject (T1).*

> *I have only received a single training and then I have reached a certain point by improving myself and searching how to use the smart board more actively. This is evolving upon one's own will. I both use technology and I am always in search of the ways I can use it better and improve it (T4).*

Some of them (n=5) also highlighted that the limited information given in the trainings or lack of courses required self-learning and self-effort for appropriate technology use in the classroom. According to them, those who were interested in technology were trying to include activities that required the use of technology in the classroom environment by making the necessary effort in and outside of the school: They were learning on their own in a way.

> *I did not receive any training for the course. There are things I learned with my own effort. I also like to follow technology, so this is my area of interest. I have a desire to learn. I like to use technology. I'm asking when there's something I don't know. We solve it with the children (T8).*

> *The training shows how it should be, but after that it is left to the teacher. In other words, the development of the teacher on his subject depends on his desire and his will. If the teacher improves himself, he can make very good presentations in the class by using what he is taught and can teach very nice lessons. After that, it is a little bit about the teacher's self-improving (T1).*

Quite a few Turkish participants (n=8) pointed out that the teachers showing no interest in technology or making no effort to support its use in the classroom could pose a barrier to technology integration in education. Interestingly, one of the participants (T7) claimed that disinterest of teachers in technology use could be a more powerful barrier than the lack of knowledge regarding technology integration. He further noted that teachers did not use technology because they were not interested in using it, not because they did not lack the required skills or knowledge.

> *One of the barriers to technology integration is reluctance. There is a reluctance not only against the use of technology, but also against all kinds of activities. There is this attitude like "I'll just give my class and leave". It is related to the teacher, to time and to everything (T6).*

> *I think everyone should use it. Because it's hard without a computer anymore. Teachers need to improve themselves about it. Especially if there is a smart board in the classroom, the student is always 1-2 steps ahead. Teachers must improve themselves in this regard. But I don't believe this will happen with the course. This person must be open to learning, to be interested, to be willing. Or even if he / she goes to the course for a year, he / she cannot succeed if there is no interest and request (T8).*

Some of them (n=3) highlighted the possible reasons of lack of interest and effort of the teachers. 2 of them stated that teachers were busy with their private life or dealing with their busy workload, so they had a reluctance to improve their ICT skills even if the trainings were provided. One participant complained that teachers had a desire to reach the information without any effort: Teachers did not have interest in doing research on how to use technology in the classroom.

> *Obviously, I haven't seen much of the teachers trying out new ways to improve teaching and learning activities with the help of technology. I think our teachers have too much unnecessary workload. Because of the extra work, they already get tired in class. I've never seen they work extra at the outside of school. Maybe it is the living conditions, maybe it is due to their child (T17).*

> *Teachers accept whatever is ready to use, they do not search for anything else. So they do nothing in terms of self-development. If they do research, there are different things they can find. They want ready to use information instead of searching for it (T11).*

4.3.2.3. Pedagogical approach

Pedagogical approach referred to the educational approach adopted by the teachers regarding ICT integration during teaching and learning processes. The vast majority of participants in Finland and also one quarter of S. Korean and Turkish participants agreed that incorporating pedagogy with the use of technology was more important than just valuing the use of technology itself in the process of technology integration.

Some Finnish and Turkish participants suggested that a change in the pedagogical approach in terms of technology integration was necessary. Similarly, a Turkish participant pointed out that use of technology may not be very effective if the correct approach was not employed. Additionally, another Turkish participant thought that the combination of teacher’s pedagogical and technological knowledge was required for a successful and proper technology integration. However, the evidences suggested that both the teachers’ and the management’s focus was mostly on how to deliver content specified in the curriculum via technology rather than how to make the teaching experience more effective for the students. Interestingly, a S. Korean participant stated that teachers should be teaching with the methods they knew best.

Because the use of technology may not be suitable for anyone if they didn't have enough pedagogical knowledge to contribute to the integration process.

Only Finnish participants pointed out that teachers would collaborate and share their ideas/materials/experiences in order to improve their technology use for educational purposes. But, Finnish and Turkish teachers were open to learn new things with/from students as they could have superior skills in using technologies. As for the S. Korean teachers, although they agreed that students might have a certain knowledge of technology use, they didn't particularly mention the possibility of learning new things from students regarding technology during classes.

In Finland, different than other countries, peer-learning as an educational practice stood out during the use of technology in the classroom. They thought that this method would help teachers improve students' overall ICT use skills.

Finland

14 Finnish participants emphasized the importance of pedagogical approach underlying the use of technology. Moreover learning with/from the students and peer-learning were other aspects of pedagogical approach revealed. The focus was on how to use specific technologies employed in the classroom effectively with the help of an adopted pedagogical approach. For example, 2 of them in particular commented on integrating technology with classroom pedagogy would be more beneficial for students rather that just using a technological tool. One of them explained this as follows:

> *Some may believe that if you use IPads, students will learn. However, it doesn't work like that. Pedagogy is more important then the technology itself (F18).*

A principal (F12) shared his thoughts that instead of buying a machine, a pedagogy that can provide ICT integration should be developed. Additionally, one of them pointed out that if a teacher could use technology effectively in the classroom, he would be regarded as a good teacher since technology use in the education required preparation and pedagogical readiness of the instructor itself:

> *If you use ICT, you are a good teacher, some of them think like that. Because it is very important to think how to use. Sometimes they forget how to use effectively, but just use (F17).*

4 of these participants indicated the necessity of change in the pedagogy since technology use in education required a brand new or a modified pedagogical approach. One of them stated he considered using iPads everyday in the classroom was much of an example of a student-centered pedagogy rather than a teacher-centered one. Because students became more involved in the learning process this way.

> *We have IPads for daily use. We have changed our pedagogy, because technology needs new pedagogy. So, it is part of our daily routines and it is the way we do things…. With these tablets, and these pedagogy we use, they go hand in hand well together. Students are learning by asking questions and problem based learning is easy with iPads. It's not teacher-centered but student-centered learning (F13).*

In particular, 3 of them indicated that teachers collaborate and share their ideas/materials/ experiences in order to improve their technology use for educational purposes. For example an ICT advisor (F15) from a training school pointed out that teachers didn't stick with only one way of teaching, but they exchanged knowledge and got help from each other in order to improve their approach by trying different methods (participatory involvement). Similarly, another participant highlighted that they tried to create a database including teachers' experiences with technology use so that new teachers as well as others could see about what worked or didn't work before in the classroom and learn from the experiences of others. One of them also further noted that planning the lessons together and using shared materials facilitated the integration of technology since they could also share their experiences regarding pedagogical use of it. One participant mentioned that change in the method of holding examinations would push teachers to change their teaching philosophy too:

> *Yes we have plans, but now the next step is for the exams, and in January we will have a computer based exam system in one classroom. Teachers will be able to try it out and experience how to use it. For this 4th period of semester we will have some pilot exams too… I think that the exam system which is coming next year will make teachers to teach with computers, and it is good thing. Because maybe only 10% of the teachers are active about ICT use in the lessons at the moment (F4).*

Another participant (F14) stated that teachers could learn how to use a particular technology from an expert, then they would evaluate within their pedagogical knowledge whether this technology should be used or determine how to use it in terms of educational purposes. She pointed out that each teacher would have their own teaching philosophy and it depended on their opinion to use technology in the classroom (teacher autonomy).

Lastly, 6 Finnish participants pointed out the interaction between teachers and students in the course of technology use during classes. They indicated that they could learn with/from students since they acknowledged that sometimes students could be better at technology use or more skillful than the teachers were. So they felt that it was okay to learn from them as well as learning together. For example, while a music teacher (F17) stated that "*some pupils are more talented than me, so I get some ideas from them*", a math teacher (F1) also commented that he had changed his paradigm so that if there was something that he didn't understand during lessons, he would go ask the students to find the solution. The math teacher further noted that sometimes he had some ideas and also pupils had some ideas, and then if students asked to use something new then they would discuss the issue together and maybe try something new. Similarly, another participant explained that:

> *Many times we have computers, projector, internet, we speak and discuss with children, we find something interesting, we want to learn more, we use internet and see that there are something more about that (F6).*

A classroom teacher (F2) highlighted that technology use of students gave him the opportunity to absorb the lessons, in turn, he "*could be a learner amongst the students, and go on and see the different way of thinking and learning*".

8 participants indicated that peer-learning as educational practice could improve students' overall ICT use skills. For instance, 2 of them explained their practices as follows:

> *Usually, I put these students who don't know well and who know well together, and they teach each other and they learn from each other (F18)*
>
> *Pupils teach others as well, they share the new information among themselves very effectively. For example, in classroom situation, what a pupil does inspires his/her friend in solving problems with the help of teachers (F12).*

One of them (F19) expressed the belief that peer-learning eliminated the idea that only teachers should teach students how to use technology. In addition, students were teaching other students too.

S. Korea

Some S. Korean (n=5) participants expressed the belief that developing a pedagogical approach regarding technology education was more important than just teaching how to use a device or tool. For example, a math teacher explained the steps to identify the approach he would adopt as follows:

> *I think the important point is not the device itself but ability to add just that techniques into the classroom (pedagogy)….I first think about concept for the class. Then I search for what is going to be suitable for the class concept. But, for all the things I already have. Because, I just know that somebody before me got the ideas, I just search for it on the internet and find it and use it…It is really hard to develop that lesson by using technology, it takes time (K2).*

Another mathematics teacher further added that the use of technology wouldn't be suitable for anyone if they didn't have enough pedagogical knowledge to realize the integration. She also stated that she preferred teachers to teach by the methods they mastered rather than struggling to use technology just for the sake of using it:

> *In mathematics there is not many changes. Like the other teachers, I have my own method to teach, it wouldn't change by the policies. It can be changed by teacher/me or students...I think this technology integration is not necessary for the all teachers. Because, teachers skills and abilities are very different than each other. So, I always say that if the technology is not familiar to you, then don't use them. But, some teacher learn how to use new technologies in the classroom, and then they use the technology in their classroom just for using technology not for teaching. This is not very useful. Many teacher has their own way to teach well. So I want to have respect for them (K3).*

Turkey

In total, 11 Turkish participants contributed to this sub-theme. Some of them (n=6) commented on the importance of pedagogical approach while integrating technology. For example one participant pointed out that if a teacher knew how to use technology in pedagogical practice, then incorporation of technology into education would create an advantage (T9). She further noted that technology was a commonly used tool in our everyday life, so she couldn't imagine an education system without technolyg use. Another participant (T7) indicated that the use of technology would not have a positive impact on the learning of the students if an appropriate teaching approach was not adopted. Similarly, a vice principal clearly highlighted that technology integration required combination of teacher's pedagogical and technological knowledge. She explained why this combination was necessary as follows:

> *All of our teachers are very good in their field, but no matter how perfect they are, the important thing here is that the teacher is able to combine the knowledge with the technology and service it to the others. So if there is a teacher who can do this, then you can tell by looking at his students. But sometimes there may also be a problem in combining technology with the knowledge and service it. What is essential here is not just technology. Watching a film or using a material from an informatics network or trying*

to teach it to the children through drama is not technology integration (T2).

3 of these participants claimed that teachers were mostly focused on how to deliver the content via technology rather than how to make the teaching experience more effective for the students. For example, a mathematic teacher pointed out that not knowing what kind of pedagogical approach would be appropriate for an effective lesson with the help of technology was a major shortcoming:

We didn't think about how to tell the lesson more efficiently in computer environment yet. We just think about how we can offer the better content. The biggest shortcoming is how content and pedagogical approach will be. The teacher-centered approach still continues (T4).

Additionally, 3 participants highlighted the need for change in teaching philosophy. For this case they meant that teachers needed to transform the teaching and learning processes from teacher-centered to student-centered if they want to benefit from technology use in education.

Similar to Finnish case, 8 participants pointed out the interaction between teachers and students while utilizing technology for educational purposes. While 7 of them were open for learning from students, 1 of them found knowing less than students and asking them about how to do things humiliating. These 7 participants who had no problem learning from students indicated that they got help from students when they struggled to use technology, and this improved both their knowledge and skills. For instance, 2 different comments of those 7 participants provided to give an insight into this teacher-student interaction:

Everything changes so fast, we learn a lot from children. I had a music on iPad. I couldn't transfer this file to anywhere. The kids handled it for me. They're very supportive. They are already very eager, they are taking care of it right away. I'm using DJ programs. I learned them all from the students. I think the teacher should be open to it. We learn something from the students, I mean, we must learn something (T8).

> *I ask students when I can't do something. For example, when I bought a new cell phone, they taught me a lot of things, and I like that they know about these things (T12).*

One participant refused the help of students. She was worried that the students would think that she had poor knowledge of technology use, and they may make fun of her. She explained as follows:

> *For example, if I did not know how to use devices; If I said things like "Come on here kids, turn on the computer!", "Plug in that USB!", the children would see me as inadequate. So I need to know it. Or let's say suddenly there was a problem in the system, and it was closed. As soon as I ask the kids for help, it's over. The children would say "She does not know anything.". I would be a joke immediately. I don't want to be in a funny situation in their eyes like elderly people who don't know how to use smartphones (T18).*

4.3.2.4. Role of teacher

Role of teacher referred to the definition of teachers' role in the process of technology integration in education. The description of teachers' role in the process of technology use showed differences amongst countries. For example, while Finnish participants defined the role of teachers as a facilitator of the learning in the process of educational use of technology, S. Korean participants attributed three roles to the teachers: guiding the students to gain the understanding of technology ethics, creating tools, and delivering appropriate learning resources. From the discourses of Turkish participants, two divergent and conflicting definition of teacher role emerged: facilitating their teacher-centered instructional methods with a teacher-dominated approach, and being a guide/role-model.

Some Finnish participants expressed belief that technology integration into education required transformation from a traditional knowledge provider to a facilitator who guided the learning process of students. The participants from S. Korea and Turkey did not make particular statements about the change in the role of teachers.

Finland

More than half of the Finnish participants (n=11) agreed that a teacher should be a facilitator rather than a director of learning. They pointed out that the role of teacher had been changed from a traditional knowledge provider to a facilitator who guides the learning process of students in the classroom environment where technology was used. 2 participant explained the change:

> *I think in ICT the most important thing is that you have to change your idea that I am a teacher and I know everything… It is not the teacher who says what you should do it is more like a supervisor that guides who is discussing with you and what you are doing now…So it is more guiding rather than leading (F1).*
>
> *The role of teacher was giving information before, but now it is guiding. Guiding is right direction (F8).*

Some highlighted that using direct instructions about what they should do in the teaching and learning processes would kill students' creativity, so the teacher could use this method to introduce a new subject at first, but then the student had to continue their learning process by the guidance of the teachers. Others explained their opinions regarding the guidance of teachers for the technology integration in the classroom as follows:

> *They are like coaches. Their role is just helping the students and guiding them. And I think teachers need to do more work before the lesson, but I think it is easier during the lesson, only guiding (F4).*
>
> *I think that I am dutiful, if I use ICT I feel younger. I don't only teach, while teaching I also learn, and teacher is mentor, not only teacher, and a guide (F19).*

S. Korea

In total, 12 S. Korean participants commented on this issue. They didn't particularly mentioned teaching technology use as something included among the teacher's main duties, but they highlighted that teachers needed to provide right instructions and guidelines to help students recognize the ethical use of technology. 3 participants described the role of the teacher as the person guiding students to gain an understanding of technology use ethics. 2 of their statements were as follows:

> *Teachers should talk about the technology ethics, teach them how to get right information. Also, teacher inform them about addiction of technology. That is important (K3).*

> *Actually in S. Korea, the S. Korean students enjoy with very limited activities such as SMS (Facebook), games and searching. So, my job is to show them there are other/more ways to use technology…Because of students being still middle schoolers, teachers should give clear guidelines to the students, like how to use the technology and software. They gather information from the really wide internet base, so teachers need to make sure that students get the right information and right categorized. Teachers help student to categorize the information (K2).*

On the other hand, the rest of the participants indicated that the teacher should create tools or deliver appropriate learning resources. They also pointed out that teachers needed to help students access right resources and tools for their studies. One of the participants stated that teachers should not focus only on technology or students alone, and focus their attention on both of them equally in order to fulfil their role as a facilitator.

> *In this situation, really right thing to do for the teacher is introducing really good source, good methods to students. Teachers should be in the between of students and technology. They shouldn't focus on only one of them, student or ICT itself. Teachers should be in the middle (K1).*

> *Teachers are responsible for creating and presenting materials via ICT tools (K20).*

> *I help the students to reach the learning contents and learn by their speed of learning by the informative devices (K7).*

Turkey

15 comments of the participants clearly revealed the difference between what the role of the teacher should be and what it actually was. While 7 Turkish participants claimed

that a teacher-dominated approach was performed in classrooms where the teacher utilized technology, 10 participants emphasized the importance of teachers as guides and role models for students during technology aided learning and teaching processes.

These 7 participants did not deny teachers' active role in the process of technology integration, but they expressed the belief that teacher-controlled or teacher-directed instruction would be more effective for students to learn technology use in education. For example, the following participant argued that if teachers didn't use the technology, students wouldn't learn how to use it since teacher-dominated approach still remained commonly accepted in the education system due to cultural structure of the society and the act of adhering to old-fashioned practices continued:

> *Students will not even touch it if you do not use them first. Because there's a bit teacher-centered system in Turkey. Even if we try to change this, the family structure is this way. No autonomy in classes. In public schools, the seating plan is still in the teacher-dominant, student-passive model. When this is the case, the child has to prove it to his teacher that if he reaches for his cell phone with the good intentions, looks something up from the online dictionary. He should say "I looked it up from the dictionary" trying to defend himself. Or some teachers might love to teach by writing. In this case, what should child do? I can say teacher has a big role, I can say it affects by 100% (T6).*

Moreover, they thought that the use of technology for educational purposes didn't change the role of teachers. They stated that they still were in the center of the learning and teaching processes. For instance, one of the participants pointed out that even if the goal was that the student could use and make use of the technology well, teachers still utilize technology to facilitate their teacher-centered instructional methods. Some examples of relevant discourses were presented below:

> *The goal is that the student uses it much better and makes more use of it. But we're not trying to do that. The problem here is that the focus should be the student, but we use it more than the student. We used to write the question on the board and tell them to deal with it, now that we can solve more questions, it seems that we [the teachers] became the center of focus (T4).*

In general, the teacher plays an active role in the classroom (T1).

I'm in favor of a teacher-centered education system. I'm not against technology either, as long as it's right and fast, I want to use it as a side element (T10).

Although some said that the teacher-centered approach continued while using technology in education, 10 participants emphasized the role of teacher as a role-model and guide. 4 of those 10 participants mentioned teachers being role-model in particular. One of them highlighted active role of students while teachers were only guiding the process, but she stated that this would not be possible without FATIH project providing the necessary equipment.

In fact, the teacher should be a guide, but at some point the teacher should show something to the students on his own. The guide will lead, help, but the main responsibility and duty should belong to the student. But this is not possible with our current technological infrastructure. Following the Fatih Project and after tablets are distributed, yes teacher can really be a guide (T20).

Another view highlighted by 7 participants was the role of the teacher as a guide. While technology use in the process of learning and teaching, they stated that teachers should be guiding students in learning process, giving continuous feedbacks and ensuring appropriate and ethical usage of the internet and technology by the students.

There are a lot of things, there are websites with inaccurate information. You have to select the site, you need to select the information among them, because some of them are not scientific. We have to make this distinction. In this regard, we tell children, these websites are good, if you want to work on biology, go to these websites, look for these books and we guide them (T5).

A teacher must be guiding. Must be a role model. And must be a guide. The teacher must allow them to work among themselves and be guided. They come and say "teacher, we have prepared this and that". Until then, I don't get involved. After reviewing it, I guide them by telling "Guys, do this part better, this part is not okay, make correction here." I'm giving them feedbacks. So it won't be oppressive and compelling. It will be with an advice (T6).

An ICT advisor, a former ICT teacher, emphasized that both teacher and student centered methods were applied according to the objectives and requirements of the course. In this context, the teacher could change his role.

> *Sometimes we go with a teacher-centered education, and sometimes a student-centered one. That's why teachers are doing both, as a lesson teller and a guide. Firstly, there is a compelling mutual narrative when explaining the lesson. Then, in the case of an interactive application or an activity, the teacher becomes a guide (T21).*

4.3.2.5. Teachers' resistance to technology use

Teachers' resistance to technology use referred to the possible reasons of resistance put up by the teachers against technology use. Finnish participants explained that teachers' resistance to technology use was linked to their lack of technological and relevant pedagogical background. However, they believed that with the proper training and collaboration, this problem could be overcame. Additionally, Finnish participants indicated that elderly teachers were resistant to technology use in particular. Once again, this matter was explained in relation with incompetency regarding knowledge and experience since older teachers had to learn and practice more to catch up with the change.

In S. Korea, similar to Finland, lack of pedagogical knowledge regarding how to integrate technology into the subject would make teachers put up resistance to use technology. Only one participant linked this behavior to age of the teachers. Some other participants claimed that teachers wanted to stick with their regular teaching methods. They stated that the teachers thought that their education was more than enough to sustain their work properly, so they didn't feel like expanding their pedagogical knowledge about how to incorporate technology into their classrooms. One participant explained that teachers' mind-set had to change to overcome the resistance, since the teachers somehow thought that technology was hard to use, not useful at all or time consuming.

In Turkey, similar to Finland and S. Korea, insufficient technical and pedagogical knowledge were proposed as a possible reason of teachers' resistance to technology use. Additionally, the participants revealed that teachers who were getting close to retirement may put less effort than younger ones in learning how to use technology in education. Because those teachers thought that they were about to retire, so they didn't need to learn new things. They were not open to change.

The participants from all the countries agreed that insufficient technical and pedagogical knowledge might cause teachers to show resistance and prevent them from using technology. Turkish and Finnish participants particularly mentioned that older teachers didn't prefer to use technology in their classroom. Turkish participants linked this approach shown by elderly teachers to the forthcoming retirement instead of their age. Additionally, they pointed out that it was difficult to change pedagogical practices for elder teachers. The same situation highlighted by some S. Korean participants as well. They thought that teachers preferred to stick with their old practices since they were used to them. They did not tend to learn new things assuming their competency level as adequate. Only Finnish teachers suggested that this issue would be removed upon training and collaboration.

Finland

In Finland, most of the participants (n=12) indicated that the reason why teachers were showing resistance against technology use was sourcing from lack of technological and relevant pedagogical knowledge. Due to lack of the knowledge, they felt insecure and uncomfortable to use it in the classroom.

> *Some teachers think it is very hard work to use, and they think it is difficult, so they have to learn it before and then to teach. First you need to learn yourself. It varies from teacher to teacher (F10).*

> *The ones didn't know how to use iPads or how to use ICT and teach with ICT perhaps felt some pressure on when this project came up… They (the ones with negative attitude) started using them more slowly… They have*

> *a lot of questions but then they are relieved when I go to classes and answer them. They don't have pressure anymore after that. They get more knowledgeable and they start to use it with their classroom. Now they are very inspired and comfortable (F15).*

A participant further noted that it would be hard for teachers to change their usual teaching methods and it will take time. When they were introduced to a new technology, they would feel pressured and they would be resistant to use it at first.

> *We have to teach the teachers first. If the teachers are not good with technology, the change is not always easy with them. Because it's a slow process and some had bad experiences with the use of ICT during -maybe- late nineties and of course in some schools you don't have the equipment that you needed to use…. Some teachers might have feeling of pressure during the school year, because they are introduced the office 365. They might have never used the cloud service. And then if you hear about this okay now you start using, they might feel pressured (F2).*

Additionally, a principal (F12) explained that after talking and explaining pedagogical and technological aspects of technology use in the classroom, teachers started to see the ways to deal with them. Some others (n=2) thought that those who already knew how to use the technology and experienced it in the past had almost no problems to get used the new methods. So, once again the teachers who had knowledge of using technology were not really struggling with technology use.

Teachers showing resistance were often said to be elderly. 4 participants argued that older teachers generally did not use technology normally. This matter was explained in relation to lack of knowledge and experience with the technology since older teachers had to learn and practice to be more resilient to change. For example, one of the participants commented that "*many teachers don't like it because we have to learn new things again, teachers who are at my age [55] don't use ICT very much*" (F9). Others explained the reasons why older teachers would have resistance to use technology for learning activities as follows:

> *They [the classroom teachers who teach ICT] get trainings. I think, every Finnish classroom teacher can do that. Also in their studies they have to*

do that, if they are not over 40. Perhaps the elderlies is not ready. They have to teach and learn this at work (F16).

We have yearly discussion about how school year has gone, how about in service training, is there anything lacking about those services? Quite often, if you are a bit old, you have couple of years left then you go to pension. You see that they are not interested in ICT and they want to be left alone (F7).

One of the participants (F8) indicated that when he first started to incorporate technology in the classroom, his colleagues discouraged him since they thought 'traditional way of teaching' was what was accepted in the community. Thus, he pointed out that the community of peers and knowledge would have supported technology use/change back then. However, by the time the community accepted the change, the ones against it already got retired and left.

S. Korea

Some S. Korean (n=5) participants gave an insight into teachers' resistance to technology use in the classroom. 3 of them indicated that teachers were resistant to incorporate technology in classroom because they had a lack of knowledge about how to integrate the technology in their teaching. Only one of them commented that "some old teachers do not want to learn or use something new or unfamiliar with them"(K6). Other explained as follows:

There are many research why teachers do not use technology. I think the most common reason is that they didn't learn about it. First of all, teachers don't know how to use technology, because they were not though at their school ages. They also think it is not necessary (K3).

I personally think that all teachers should be trained in the use and application of ICT in education. One day we took the students to a picnic, where the teachers had placed QR codes and the students had found them. But there was a problem: The teachers interested in it were doing it, but the teachers who were not interested could not do something that normally they could easily do with their smart phones because they were fearful or not interested. Therefore, I think there is a need for trainings (K4).

3 of the participants claimed that some teachers didn't lean towards technology use, because they thought that they had enough knowledge thanks to their education. However, one of the participants pointed out that teachers were thinking like that when the new technologies were first introduced. Now, since the knowledge of use and related pedagogy were more clear, the teachers had started to incorporate the technology more in their classes:

> *For some teachers. I think in S. Korea teachers are very talented and highly educated. So, teachers think they can teach well without technology. Teachers are always busy. They have paper works (K3).*
>
> *At first, teachers didn't feel like any need for ICTs. But, by now, there are a lot of good methods for implying the ICT. For example, in our music classrooms, there are a lot of technologies that require a lot of technique to use. So teachers are really interested in how to imply at classrooms by taking the classes. It is kind of common (K1).*
>
> *The teacher think that the techniques are not going to be helpful for education (K2).*

One of the participants (K2) provided extensive information regarding the reasons why teacher didn't want to utilize technology in the classroom. He claimed that some teachers found technology hard to use, not useful or time consuming, and he linked this beliefs to teachers' mind-set. Interestingly, he further noted that the mind-set was defined by culturel values. For example, he stated that S. Korean education was examination and success driven. Thus, teachers didn't want to use technology in the process of teaching and learning, because they didn't know if technology use did really improve students' learning experience or not.

Turkey

In Turkey, the reasons specified related to teachers' resistance to technology use were difficulty in changing old habits and mind-set, not being open to change, lack of knowledge related to technology use and educational implementation of it. The participants expressed the belief that the older teachers were most likely to show resistance to the use of technology: They linked the reasons to the age of teachers. One participant (T11) commented that when the age is higher, people tend to have more fixed ideas and it is not very possible to change them. Another participant (T4) highlighted that the system or policy change wouldn't be beneficial if there was not a good practitioner of it, because he claimed that the biggest source of resistance in every change was always the teachers. For example, an ICT advisor explained that as follows:

> *When the first smart boards came within the scope of FATIH project, the teachers thought about whether they really had to use it or not. There were those who said that they did not want to use it. And there were those who said "We had to use it" and really tried to use it. This approach varies according to the teacher (T21).*

In total, 15 Turkish participants commented on this issue. 5 of them stated the older teachers struggled to change their way of doing things when new technologies and techniques introduced. Following participant explained that change had always been difficult:

> *There's a set of habits left from the past. It's hard to change past habits. For example, while we are preparing some exams, some of our teachers make photocopies, then cut and paste them to make new photocopies. There are teachers preparing exams by choosing (cropping) the questions from the scanned copy of the book at the computer, but they are very minority. I guess it is easier to maintain their past habits rather than replacing them with the new ones (T10).*

3 participants draw attention to that some teachers didn't want to change anyway. They believed that some teachers were not even open to change a little bit. For instance the following participant provided some explanations for the situation:

> *There are technological tools in the classroom, but many teachers keep going with their traditional teaching method, and they don't feel the need for the tools. They are thinking like "We have done it like this up to now and it can be the same from now on too." (T4).*

Another participant (T12) identified the resistance as the beginning of the change process. Because, she stated that, teachers always showed resistance to new technology and once others started to adopt it, the ones who didn't want to use started to use it as well.

6 participants highlighted that avoiding the use of technology may be caused by not having sufficient technical and pedagogical knowledge. Here again, they indicated that the age could play an effective role in lack of technology knowledge. For instance, one of them (T1) stated that it can not be said that it was sourcing from reluctance for some of the teachers. It may be because they didn't really know how or they didn't have time or they didn't use it since they had never encountered with it before. Another one (T6), interestingly, said that teachers might be disinterested with technology use due to lack of knowledge and the male teachers were more fond of it while the female teachers remained less interested in it. Some other participants explained as follows:

> *It's useful when used properly, but many friends don't use it sufficiently and properly. Many react to avoid using it. So you can develop the technology here, but you have to raise the teacher to be ready for it. For example, many teachers are resisting at this point (T4).*

> *Teachers don't spend time. And there's a fear of not knowing since they didn't try and do it. When someone doesn't know something and doesn't do it, he doesn't want to try it. I believe they will be able to do it if they ever overcome this feeling (T9).*

Lastly, 6 of the participants claimed that teachers who were near to their retirement may put less effort than younger ones in learning how to use technology in education. For example, one of the participants (T4) stated that one of the teachers was not very open to technology use and the participant's observation was of that the mentioned teacher didn't attach importance to it since his retirement was close. Examples of statements were provided below:

> *Most of the feedback was good, but occasionally those of my age [50], those who have now close to retirement think like "We have taught for years, now where did this come from, how am I supposed to deal with this*

in the classroom after this time, or my knowledge is enough for me, for my student, I work at a vocational high school If I can keep the child in place, it is good enough for me." They said that it is not possible to teach anything (T2).

Newly graduated teachers are better than us, at peace with new generation technology. Our older teachers, such as the ones close to the retirement, hate technology. As the generation becomes younger, they become more open to technology (T5).

4.3.2.6. Teacher Motivation

The reasons of teacher motivation for ICT use in the classroom were reported according to the participants under this sub-theme. In total, 34 participants from 3 countries commented on this issue. 15 of them were Finnish, 5 of them were S. Korean, and 15 of them were Turkish participants.

Most of the Finnish participants claimed that their motivation was driven by students' positive feedback as well as their own desire for ICT use. S. Korean participants were more focused on teaching how to use technology in the right way, since they believed that the students were using technology often in their daily life. The motivation of Turkish participants were mainly based on getting positive feedback from students as it was for Finnish participants. However, they also claimed that students needed to learn how to use technology considering their future as a requirement of this era, so they felt responsible of teaching them. Similarly, Finnish participants indicated that they felt motivated to use technology, because students would be prepared in terms of skills of the future with the help of incorporating technology in classroom. Interestingly, only some Finnish participants expressed the belief that the use of technology in education would enable the students to grow up to be 'good citizens'.

Finnish and Turkish participants also claimed that they felt motivated to use technology because it was enhancing students' learning experience. Some Finnish participants further noted that it was improving their teaching as well. Differently from Finland and S. Korea, Turkish participants mentioned self motivation originated in being interested in technology use, and the necessity of keeping up with the students' needs as their motivation. Lastly, a S. Korean participant stated that being an inspiration for the teachers motivated him to use innovative technologies more. Interestingly another S. Korean participant claimed that some teachers used technology as a tool for showing off during open-class activities. They were motivated to use variety of tools to demonstrate all of their teaching skills.

Finland

In Finland, most of the participants claimed that teacher continued use of ICT as a teaching aid was driven by students' positive feedback. Teachers also felt that it was fun to use ICT in the classroom, since it could improve their teaching and students' learning experience. Some of the teachers also indicated that it was normal to use technology in the classrooms as it was already a part of students', and teachers' daily life. For instance, one participant further noted that since students used ICT more nowadays, she felt the need for ICT use more in the classroom. Some exemplary statements were as follows:

> *The community of Finland has technology around, and we can't take school away from the technology (F8).*

> *I have been using ICT all the time. It will not be a problem for me. However I need to use it more and more because of students' routine (F4).*

In total, 15 Finnish participants indicated their motivation to use ICT in their classrooms. 7 of them pointed out that their motivation source was positive feedbacks of their students when ICT was used in the process of learning and teaching:

> *You see that children are really excited to do something and it gives you the feeling of alright this is going well (F11).*

> *I have to use and students like that technology is used in the classroom; that is why I feel motivated… Before teachers were higher and students lower but now we are the same level while using ICT (F19).*

4 Finnish participants stated that using ICT in the classroom was fun. Because they thought use of technology improves their teaching as well as students' learning experiences:

> *I find it useful, teaching is fun with it... I found it fun… I think I am following [a vision for ICT use]. But it is not kind of I have to do, it is something I do to develop my teaching skills…When something new comes I get really motivated. Yes [students also make me motivated], and I have really fun classes, we don't have to argue any more, we can talk everything, I have more time for one student during the class, because of the technology (F8).*

Another 4 Finnish participants pointed out that it was normal to use technology in the classrooms since the students had been using technology in their daily life.

> *It is not my topic but when it is helpful of course you can use technology… Of course I know it is a very big part and important of students' life and that is not normal that we don't use it (F17).*

> *Well there is no pressure to use ICT because it is important to use it anyway. Because it is a part of the world we live in, so I don't against it or anything like that… It is how it is and we have to deal with it and in many cases it makes things easier (F11).*

Additionally, some participants (n=8) expressed the belief that understanding the use of technology in all areas would prepare students for the skills of the future: They would have the skills needed for the business and social life in the future. One (F1) stated that the earlier the technology use starts, the sooner it becomes a habit, while others pointed out that students would have the skills required for the future job application: For these reasons, teachers felt motivated to use technology in their classrooms. Some exemplary statements were as follows:

> *It is the future. Students have to learn how to use these tablets and computers. They will use technology in the future and in their job (F19).*

> *I think there are certain skills that you just have to have today because you use the banks through computers like online banking and there are all these administrational things with the Finnish government that you have*

> *to use your bank codes to get in to the service so everybody has to learn it (F11).*

Another 2 participants further noted that the use of ICT was a tool to be used in the creation of "good" citizens out of youngsters educated in the schools. Thus, they believed that they had to incorporate technology into their subjects in order to give an opportunity to develop their student's digital skills to be the good citizens of the future.

Moreover, although curricula and policies put pressure for the use of technology in the classroom, 3 Finnish participants also said that they use technology in the class only due to keeping up with the change. Teachers seemed to feel the necessity of using technology in the class so that students could adapt to the changing world and they could have a classroom environment that was compatible with their daily life environment. Lastly, one participant (F1) claimed that assessment criteria for teaching profession included technology use in Finland. He further noted that if teachers integrated technology in teaching and learning processes, this would have a positive impact on their salary increase. Thus, using technology may have the potential to contribute to salary promotion.

S. Korea

5 S. Korean participants provided insights related to their motivation for the use of technology. 3 of them pointed out that the use of technology was already a part of students' daily life. One of them highlighted that without using technology in the classroom, the lesson would become boring for the students:

> *Students are accustomed to multimedia and IT. If I don't use ICT, they are easily bored with my lesson (K10)*

She further noted that when she use technology in the classroom, this would encourage students to use technology. Moreover, she believed that if use of technology could motive and help learning of students, ICTs were needed to be utilized since the students were digital natives. Another S. Korean participant commented that since the students were dependent on their smart devices in their daily life, she wanted to teach them how to use the devices properly instead of rejecting benefiting from them in the lessons.

> *I organize some classes with smart learning tools and students love to play with the smart devices. I am personally not a big fan of using smart devices in my class since I am afraid of the addiction to the students due to the smart tools. Though I got some training courses about smart learning because it is obvious people are dependent on smart devices more and more. So I think students need to know the right way to use them (K13).*

Another S. Korean participant (K2) indicated that online platforms including file sharing and storing platforms help students being more engaged during teaching and learning process. He also claimed that soft copy lesson materials were more effective to use for both teachers and students. Due to this affordance of technology, he was motivated to use it. He further noted that how he used technology in the lessons could inspire other teachers when they talk about it together. The idea of being an inspiration was also a motivational source for him.

One S. Korean participant pointed out that most of the time teachers loved to show off for open classes. The use of technology was a tool for showing off. He claimed that the teachers normally did not use the technology as they did for these open classes.

> *…There are some similarities that S. Koreans have. This [the fact that while teachers do not use technology in their normal lessons, they are trying to use technology especially for these special occasions (open class)] is one of them, we like to show off like that. Because we do open class only twice a year, and in these open classes students' families come. We are working very hard for these open classes, we are making preparations. In a way, to show the work that we do, even if it is usually on the basis of PowerPoint, we also show a video and we are trying to use technology (K4).*

Turkey

15 Turkish participants commented on their motivation for using technology in their classes. Most of them (n=10) stated that they wanted to use technology in teaching

and learning processes in order to provide more effective education, and deliver new information to students. They also further noted that their motivation was driven by students' positive feedbacks as this was also noted by Finnish and S. Korean participants. 8 out of these 10 participants pointed out that enhancing students' learning experience, and in return getting positive feedback were keeping their motivation high. Exemplary statements were as follows:

> *We have the priority to make the lesson more efficient, or to process it more efficiently by using interactive boards. So if the success of the student increases with this, even a little, it is a measure for us. When the students come up with the positive feedbacks such as our teacher teaches us very well, he is using the board very well, or he is teaching us a lot more efficiently, of course, we see that our teacher's effort here gives results (T2).*

> *I follow some websites. I would like to show it to my own students if there is something like an activity, a question that I like. I'm motivating myself by thinking that my students should see it, should know it too… Their learning and my desire to teach motivate me (T18).*

Some of the participants (n=4) highlighted that using technology helped teachers to attract students towards lessons, and enhance their learning experience. This helped teachers to feel motivated to use technology. One of them explained this as follows:

> *Communicating with the teacher via e-mail is more interesting for students. Since it is interactive, they enjoy it more ... I am motivated by the willingness of the students and I give more advanced homeworks to them ... It would be so right if I say that using technology is more enjoyable than grading exam papers. I really prefer to use technology all the time instead of reading lots of papers. Let them e-mail the thing they write. Or I am thinking of having them prepare a technological portfolio, for now there are only paper files. They definitely need to work in digital. They also have the chance to correct it immediately and send back when you send an assignment by e-mail. They immediately evaluate their mistakes. It is more useful than giving the exam paper and making them control it (T6).*

Even if one of the Turkish participants stated that she used technology to reinforce what students learned, and to provide them with some better opportunuties or course materials. She also interestingly said that the true motive behind her using technology was that she felt a pressure about not wasting the available devices and technological possibilities by leaving them unused.

6 Turkish partipants indicated that they had self motivation to use technology in their classes. For example, some of them said that they liked using technology because they knew how to use it, and they were already interested in using them:

> *That is because I like it [to use technology]. If I didn't, I would be looking for anything to motivate myself. But I am already motivated because I like it. (T9)*

> *I am motivated by the fact that I know how to use technology, because I can teach and understand much more comfortably and quickly, I can transfer more knowledge. (T21)*

2 participants said that they used technology to do their best in their job. They also claimed that they felt responsible for the students, so they preferred to use technology.

> *If I'm doing this, I have to do it the best. I am trying to reach whatever I need to know about a subject and whatever resource there is to reach (T4).*

> *I feel responsible for the students myself (T8).*

Some participants (n=3) expressed the belief that teaching how to use technology itself was necessary. Because they thought that it would affect students' use of technology in the future and in other courses. Thus, teachers wanted to use technology in their classroom. The other 3 Turkish participants pointed out that they felt the necessity of using technology because they belived that it was the necessity of this era. Additionally, particularly 2 of the participants mentioned that they wanted use technology to keep up with students. One of them explained as follows:

> *Since children are already open to technology, I think the role of the teacher should not remain traditional, they should be able to use technology. The child is already a child of technology era, you can't tell them the lesson, make them write, non-stop, continue from the classic book all the time. That's why we need to teach children in a more modern way. We need to update ourselves (T5).*

4.3.2.7. Teachers' use of ICT

Teachers' use of ICT reported the results regarding how teachers actually utilized technology for educational purposes. This sub-theme revealed the technologies that they used in learning and teaching process as well. Teachers' use of ICT was categorized into two: Available content and available time. That was because the findings suggested a relationship amongst teachers' use of technology, their available time and provided content.

In Finland, iPads, Apple apps, and cloud services were extensively used more than computers and laptops. Google services and apps were popular for communication and collaborative work. Finnish participant indicated that they used projectors, editing programs, word processing and social media tools as well as specific web-based subject-matter apps for educational purposes. Kahoot and Sokrative [quiz apps] were most popular apps for science and math lessons. Additionally, they claimed that they incorporated social media tools (Facebook, Twitter, and WhatsApp) as well as Nearpod for supporting engagement. Finnish teachers didn't only use technology in the classroom but also, they used it for pre- and post course work. They stated that they prepared relevant materials, shared these materials via online and cloud services, and communicated with other teachers with the help of technologies.

In S. Korea, the participants indicated that they mostly would search for information and subject-matter content on the internet with the help of computers or smart phones in the classroom. Presentation tools such as PowerPoint and Prezi were commonly used. Some participants also stated that they utilized movie maker, YouTube, Google services, multimedia materials (i.e. music, photo, video clips, etc.). A participant defined the use of technology for showing videos and visuals as a very basic level of technology use, and further noted that every S. Korean teacher would have basic ICT skills. Unlike the other countries in the study, different applications and devices such as mirroring devices, skype, and broadcasting were also utilized in S. Korea. Interestingly, one participant claimed that although teachers' pedagogical and technological knowledge was sufficient, they did not use this knowledge for the use of technology in the classroom. Additionally, some teachers' ability to use technology would be far behind of students' ability.

In Turkey, projections, smart boards (existed if the school was involved in FATIH project), computers, CDs, and smart phones as hardware, EBA system, Word, and PPT as software were commonly used. If the school was not a part of the FATIH project, the teachers were using computers and projectors to display PPT presentations, pictures and videos. If the school had a smart board within the scope of the FATIH Project, they were presenting the digital format of textbooks, the questions about the subjects and the visuals (ready-made materials) by using the smart board. Some participants stated that although the technologies used in the process had changed, the purpose of using them did not change. Most of the time they were used for delivery of ready-made materials. For example, the teachers from the schools within the scope of FATIH project explained that before the smart boards were given, they were using projectors for showing dijital content, displaying PPTs, and watching videos. Currenty, they did similar activities with smart boards. The tablets were not commonly used in the classroom, since they were limited to connect internet, smart board and other applications. Also, teachers believed that use of tablets become a distraction for the students.

An applicaiton of smart board named 'Starboard' and an online content provider 'EBA' were not commonly used by the participants. 'Starboard' wasn't useful, because it was time-consuming to prepare necessary materials to use it. Contents and the informations provided on EBA weren't found very basic and not compliant with the high school level. However, primary and elementary school teachers didn't comment negatively about EBA. Details of the reasons why they were not used were reported under "Available Content" and "Available Time" categories. Findings also indicated that social media or communication tools were not used for educational purposes most of the time. The smart tablets and phones as technological tools were not used much as well.

The teachers from the schools that were not in the scope of FATIH project explained that they could only try to use projection, speakers, computers or laptops and CDs based on their availability. PPTs was the commonly used presentation tool, and images and videos provided via internet were the most used multimedia in the classrooms. CDs that was given along with the workbooks were used by English teachers. Only few participants who were from elementary school level mentioned the use of online education platforms such as EBA and Vitamin Education.

Finland

In Finland, during the interviews and observations it was noticed that teachers were aware of the available software and hardware they could use in their lessons and they were competent enough to utilize these resources while teaching. They were confident in their teaching and activities that they prepared. For example, many participants mentioned at least a couple of applications, tools and methods that they could use in the teaching process with technology. In total 14 Finnish participants gave insight regarding their use of technology during the teaching and learning processes.

Finnish teachers were using iPads, Apple apps, and cloud services extensively more than computers and laptops based on their availability. While one of them explained that iPads were easier to use for them, the other one stated that they also use computers instead of iPads when there was a student who needed some extra help with the learning. ICT advisor further noted that they mainly used Google services and apps for educational purposes since they could work on both iPads and computers, they were free and they enhanced teacher-student interaction. Furthermore, these services would help teachers communicate with the students in and outside the school.

> *We mainly use Google apps for education because it works on computer and iPad…We use those docs' sheets, slides and drive, and Gmail… We*

talk with the teachers through google plus or email inside our school… We are now starting to use the google apps for education: It provides emails, cloud stores and the Google classroom which helps to give the assignments to the students and then they can return it to the teacher and the teacher can create it and so on. So one place to put them on and it is free for the schools (F15).

6 of the participants explained what kind of tools were used in the classrooms in detail. They indicated that they utilized the tools that would require basic ICT skills. They would involve ICTs into the learning and teaching processes by showing visuals on the projector, using editing, word processing and social media tools as well as utilizing specific web-based subject-matter apps:

There are 5 apps which everyone uses and the google apps services app as well. About 5 apps which everyone uses; book creator notability it is for pdf annotation, then explain everything you can do things and animated and so on, I think most of them use that, IWork for pages and iMovie for editing film. Some of them use GarageBand for mixing and editing music (F15).

I mostly use tools that are meant for processing information (writing and counting tools), for documenting (photography or video making), for processing the information that we have collected by writing or making videos or for learning some specific skills, very small tool for only one purpose or tools that will improve the interaction/communication between students, tools to teach the students how to interact as a responsible adult via social media (F5).

The apps used by the teachers depending on their subject were specified by 6 participants. Observations and participants indicated that Kahoot and Sokrative [quiz apps] were the most popular ones amongst science and math teachers. They would also use social media tools (Facebook, Twitter, and WhatsApp) as well as a tool called Nearpod [collaboration tool] if students were old enough in order to promote engagement. Exemplary statements were as follows:

We use the box.com which is a cloud service, also Kahoot…We also use that (PowerPoint). Written assignments with the Word and other programs. We share our work. We might make comments. So that's one thing right now we are trying to learn. Because the children are so *involved in all these Instagram's and Facebook's and such how they communicate with each other in such environments that's something that's we are trying to bring into the schools which is not in the curriculum (F2).*

In Mathematics I use Kahoot, Sokrative and explain everything about them… I also use Google drive… I have used Facebook in mathematics it was quite good, I can share my materials, it was students' idea that we use Facebook, because I make videos and students can watch these videos at home and students say that it would be better if you use Facebook (F19).

3 participants indicated that ICTs were not only used in the teaching and learning processes in the classroom, but teachers also utilized them in order to prepare relevant materials, share this materials via online and cloud services, and communite with other teachers. Technology was used for pre- and post-course works. One of the participants claimed that some teachers seemed to use technology well, but actually they were not using it effectively. Because she didn't think that reading e-mails on an iPad would mean technology integration:

The EU studies show that we have a lot of computers and iPads and stuff, but the teachers are not really using them well enough… For example, my husband's major is High School Biology. Their ICT use is reading e-mails by iPads that is not the use of ICT in education. It is not integration. This is not that they do the work in bad matter (when they dont use ICT in education). I say that they are too busy with their regular work to concentrate for building their curriculum with the ICT (F5).

S. Korea

Most of the S. Korean participants (n=17) explained their use of ICT. According to observations and interviews, all of these participants indicated that teachers would commonly utilize internet for searching information and reaching subject-matter content/materials on the computers or smart phones. The following statements can be given as examples:

I usually use various teaching materials through web search such as videos, flash games, songs, etc. (K13).

Teacher can use contents of the Internet community or purchase on-line contents of private companies (K14).

The presentation software such as PowerPoint or Prezi were also commonly used tools by the teachers in the classrooms. For example, while a participant commented as "I use technology for delivering and presenting course content. I also use PowerPoint and search information on the internet… Effective and interesting information presentation can enable technology integration" (K20), other one gave a general idea about teachers' use of technology in S. Korean schools as follows:

Of course, the use of technology varies according to course, but I, as you have seen in my lesson shortly before, use the computer, PowerPoint presentation in science class, if I have a video I am showing it. In general - you have already seen the conditions of our school - the conditions in all schools in S. Korea are like that. I personally use the computer for students to do research, the PowerPoint and the videos to make presentations. However, I once used "mirroring" (K4).

In a very similar way, half of the S. Korean participants (n=10) made comments like "*I use PowerPoint, Prezi, Movie maker, Youtube, Audacity, Google survey, Google drive, multimedia (i.e. music, photo, video clips, etc.), Scratch, etc…*" (K10). Some of other discourses provided below as the examples:

I use PowerPoint and Prezi. I also utilize computer, laptop, beam projector to present tasks or to give a lecture. For group work, I use smart pads and smart applications (K7)

I use ICT tools in the introduction part of the lesson… I use MS PowerPoint, Internet (search for information) to facilitate teaching-learning activities in the classroom (K16).

Most of the teachers had basic ICT skills. One participant claimed that a significant proportion of S. Korean teachers would use technology at a very basic level (like showing videos and visuals):

For basic level of ICT use like showing video, I think 80 or 90 % of teachers use technology… For online collaboration system, cloud

> *technology, Classting, smart board, smart education would be considered as advanced level and not many teachers use them (K2).*

S. Korean teachers also utilized different applications and devices in their lessons that were not mentioned by the participants from other countries. For example, some of them were mirroring devices, skype, and broadcast. Teachers were also using applications related to their subjects. For example, a math teacher stated that she utilized GeoGebra on the tables. However, one of the participants claimed that teachers' ability to use technology was far behind of students' abilities. Moreover, even if newly graduated teachers' ability to use technology and pedagogical knowledge were adequate, they wouldn't use these abilities and knowledge to incorporate technology into education:

> *I want my students to have really basic ability to use technology. But they really know advanced things, sometimes they are better than me. In some cases, sometimes there are very unexpected or surprising wizard that the teacher didn't know but students find it and do it in the classroom right away. Students' ability is really high, it is just all about teachers, and they don't use it. We are kind of behind... New generations know very well about technology and techniques and stuff but they don't relate it to education (K2).*

Turkey

In Turkey, the participants (n=19) indicated that projectors, smart boards (if they were involved in FATIH project), computers, CDs, and smart phones as hardwares, EBA, Word, and PPTs as softwares were commonly used in the classrooms. For the use of presentation tools, a participant (T1) commented that "PPTs are one of the most commonly used technologies, sometimes students may react as "Are we going to watch a presentation again?".

Even if tablet PCs were distributed to schools under the FATIH project, they were not commonly used by the teachers. They also utilized internet to do research and reach relevant resources within allowed internet content by the MoE at school. One participant (T4) stated that since there were limitations, in the class, they were not able to use a lot of things by connecting to internet.

If the school was not a part of the FATIH project, the teachers were using computers and projectors to display PPT presentations, pictures and videos. If the schools had a smart board within the scope of the FATIH Project, they were presenting the digital format of textbooks, the questions about the subjects and the visuals (ready-made materials) by using the smart board. Some participant (n=4) defined this situation as the use of technology for only delivery of ready-made materials by teachers. Similarly, another participant claimed that they made use of the provided technologies for delivering contents only. He further noted that even if technologies were upgraded in the classroom, the purpose of use didn't change at all. He explained this situation as follows:

> *Before these smart boards, each class had a computer and projection. Then we switched to the smart board. Functionally, for example, we are currently using the smart board as a projection. Only the size of the board has changed, we are able to use it by making actions and calculations on it. Most of our use of smart boards is for reflecting, it doesn't not have much of an intended use rather than that anyway since the smart board doesn't contain a lot of content. We do not produce any new ideas for use. We have a smart board, we use it, we do lessons with it (T4).*

In a similar way, one participant (T3) explained that in the past they had used projection to do the same things that they did now with smart boards: Displaying multimedia. He further noted that anyone who could use a computer would easily use the smart board as well.

In the high school, the smart board was commonly used since it was the common technological tool in the classroom (T5). Most of the participants (n=8) who were from a high school indicated that the purpose of smart board use was limited to showing digital version of textbook, displaying PPTs, watching YouTube videos, and providing the subject-relevant exam questions on the screen. Further details about how the smart board was used in the classroom provided as follows:

> *In general, all teachers use the smart board actively in their classes. All of our teachers actively use the smart board by uploading the pdf of the books, uploading the presentation slides, or providing content via the internet (T9).*

> *It is possible to reach the programs of the books prepared by some publishers. Therefore, you can transfer the textbook to the board without buying it. You can solve the questions from there and show the correct answer to the student from there. It is possible to show them directly as a film rather than telling the story (T3).*

A visa principal (T2) drew attention to misuse of smart boards. She explained that teachers and students could watch a movie related to subject during the entire period of lesson rather than just watch the most effective part of the movies. She expressed the belief that they did this in order to fill the course hours.

The applications specifically designed for the smart board were not used very often. Only 2 participants mentioned "Starboard" application, but they weren't happy with the application. The preparation of its materials was time consuming, and it was not suitable for the education level of high school students. One participant stated that "*The teachers have no time. Now, in their free time, the teachers must sit and work on the Starboard or install it on the computer at his home and work there. In general, our teachers tend to choose the easiest way possible, always thinking of finding something ready to use on the internet, and just use it as it is*" (T9), while other one commented that "*there is a program called Starboard, you open this program, it is more suitable for elementary school, middle school teacher, not suitable for high school. In high school, we do everything by using Google*" (T5).

2 high school teachers and 2 elementary school teachers mentioned a social education platform named EBA (Educational Informatics Network). There were contradictory comments about its usage. At elementary school level, while one (T11) stated that "*There isn't much teachers using EBA*." , other one (T13) said "*They are able to use EBA very easily and well in every aspect of it. Teachers can utilize EBA regarding the subjects while telling the lesson.*" . Similarly, at high school level one participant (T8)

liked the idea of EBA and stated that he utilized the platform in his music lessons; other participant (T5) marked the contents available at EBA inadequate for her biology lessons.

At high school level, only 1 participant mentioned that she used ‘WhatsApp’ for communication with the students. Another participant commented that she actively utilized e-mail for learning and teaching processes. Other than these 2 application, nobody else mentioned any other social media or communication tool that were used for educational purposes.

The smart tablets and phones as technological tools were not used as much. Only 3 high school teachers stated that sometimes they used smart phones in the teaching and learning processes. While, 2 of the high school teachers (T2 & T6) stated that the smart phones were allowed to use only to use an online dictionary, other high school music teacher (T8) highlighted that he was using smart phones for ‘tuning’ excersises through some apps, and an app installed on the phone that made easy for them to play songs. Again only 3 participants (T2, T5 & T10) talked about the use of the tablets and stated that it was not used actively. One of them (T10) explained why they were not using these tablets: “*We look at the tablets distributed under the FATIH project as unnecessary. Because we have no connection between the smart board and our tablets and our students' tablets*.”.

At primary and elementary school level, since FATIH project was not implemented yet, they didn’t have smart boards installed in the classroom. They didn’t have tablets for the students as well. In this context, 9 participants from primary and elementary school level stated that they could only try to use projection, speakers, computer or laptop, and CDs based on their availability. One of the participants (T16) further noted that he sometimes used his phone as a modem to maintain internet connection.

CDs were provided with workbooks (T11 & T12). For example, an English teacher (T12) stated that she used CDs of Oxford's books and students loved them very much.

Once again, PPTs was commonly used presentation tool, and images and videos provided via internet were most used multimedia in the classrooms. For instance, the comments of 3 participants on this matter were shared below:

> *I use computers, projection and course CDs. CDs also have PowerPoint presentations I use them (T19).*
>
> *We use the projector most. Other than that, we use the Internet. Apart from that, there is nothing much we do (T20).*
>
> *I use the book by projecting the subject and the related video and slides like visual materials on the blackboard (T15).*

Only 2 participants (T19 & T13) who were from elementary school level mentioned the use of online education platforms such as EBA and Vitamin Education. Lastly, 2 participants explained their use of technology with the students for educational purposes:

> *We're preparing a portfolio, for drama and music classes. Children do these things using technology for sure. For example, they make a short film, there has to be a technological tool. And they do it on their computers or phones. They use at least one technological tool even in the dramas performed in the classroom. They did Hansel and Gratel, for example. They used the board; they used it for effects and also brought a computer. They used it for music. So there exist a little technology use somehow. Or we are watching movies (T6).*
>
> *Sometimes we give project assignments. For example, they need to observe a plant's growth phase. In doing so, the child cannot always bring that plant and show it to me. Because it's a long process. I'm letting them take a picture or a video. They can bring and show it from their tablets (T18).*

4.3.2.7.1. Available Content

Available Content referred to the subject content that could be accessed both digitally and online available to the teachers and students. In Finland, schools would purchase licenses for e-materials and subscription-based services that included collection of web tools. For instance, there was a Finnish-developed e-learning environment named

PEDAnet. It was developed and maintained by The University of Jyvaskyla. The findings indicated that there was a transition from the use of hard copy materials to the use of digital materials in Finland, because e-book distribution and updating the texts on digital materials were cheaper and easier. However, some participants claimed that the use of digital platforms brought compatibility and sustainability issues along with it. Additionally, half of all Finnish participants found available educational e-materials inadequate. They further noted that the material preparing process was so much time consuming.

In S. Korea, not many participants neither complained nor showed their appreciation regarding the available course content. But one of them said that they needed to have up-to-date material constantly. Another one pointed out that the knowledge gained by technology use sometimes did not find its true place in practice, because it did not always help students solve the exam questions or practice questions asked. Provided testing materials and digital teaching materials were not directly related or exactly parallel to the content that students had to learn for their exams. Another issue arose from online content issue was a need for improvement in the use of safe and ethical content. The teaching applications and contents was suggested to be used after they were properly tested in terms of safety and ethics. Additionally, the development of special programs that could be used in the schools would be a solution to safety and ethical concerns, rather than the use of commercial applications.

In Turkey, availability of good quality and adequate content was regarded as important – if not more important than the technology itself. A considerable amount of participants complained that a little content was available on EBA and they thought that their quality was debatable. In this context, when they wanted to reach out other sources online to provide variety of multimedia at the school, they were faced with internet censorship and content restrictions because of the national education and government regulations. Some participants highlighted that the restrictions and having insufficient content did lead to the emergence of the unwanted behavior of students.

For example, the students would try to change the settings of the tablets and the boards and breach the security measures by downloading illegal programs.

Finnish and Turkish participants in particular found available content insufficient in terms of amount, diversity and scope. A S. Korean participant highlighted the necessity of having up-to-date materials and provision of safe and ethical content. In Turkey, internet censorship and content restrictions undermined the process of technology use in the classroom. In S. Korea, a teacher said that teaching with technology did not always help students solve their exam questions.

Finland

In total 12 participants commented on this category. In Finland, there was an active use of online services as well as applications. Also, establishment of a platform consisting of online materials had done under a regional R&D project at the Finnish Institute for Educational Research, University of Jyväskylä. The platform allowed the teachers and the students to create their own course materials and share them with others. Moreover, this platform supported collaborative work. In total, 5 participants provided information regarding this Finnish-developed e-learning environment. These participants indicated that they liked to use this platform because it was in Finnish, supporting collaborative work, and accessible from both school and home. For instance, following participants explained the platform and its use:

> *Wireless internet connection is open to the students. Students have their e-mail addresses, they have right to use Microsoft 365, they have e-learning environment via PEDA.net, which is small Finnish e-learning environment. We like to use it, because it is small and Finnish. It is Jyvaskyla University's product (F5).*

> *The ministry of education is preparing some kind of I-cloud services for the schools and education area generally in Finland… Schools can share materials there and it is mainly free but there are the publishing houses inside of it too. It is some kind of line where you can make your own materials and share it (F12).*

In Finland, the transition from the use of hard copy materials to the use of digital materials was clearly observable in the schools. But this didn't mean that the hard copy materials were never used again. It was a transition period in progress. Because, they believed that in the future there will be only digital materials instead of printed materials and they needed to be prepared for it. Moreover, e-book distribution and updating the texts on digital materials were cheaper and easier.

There were 3 main complaints related to materials and applications that are in use. The first one was regarding the establishment of platforms compatible with the available tools and equipment (n=2). The other one was regarding the sustainability of applications employed (n=1). And lastly, even if there were provided materials and platforms, the teachers find the educational e-materials inadequate and the material preparing process so much time consuming (n=11). The time management problem sometimes affected the productive use of technology or materials negatively. 11 Finish participants claimed that preparing and presenting the course material take a lot of time:

> *Sometimes it is not very easy to give those iPads to the students. Because there are not enough programs for schools or internet material… It is growing so fast, we don't have enough materials… We do it (material) ourselves and it takes so much time. We need to do it better (F17).*

> *I try but it is very difficult, it takes a lot of work. Now I have to do all the materials that the books are not offering by myself... The teachers don't have any materials so you have to do it yourself... You don't have time, you want to do something else, do it in night time or evening. For example, I haven't had time today for material preparation and I just showed them a video (F8).*

S. Korea

Only 3 S. Korean participants commented on this issue. One of the participants (K8) pointed out the necessity of constant up-to-date material provision for a better technology integration in education. Another S. Korean participant stated that the knowledge gained by technology use sometimes did not find its true place in practice.

In other words, when the students were taught the lessons by using technology, it does not always help them solve the exam or practice questions asked. A teacher argued that this was because the testing materials and digital teaching materials provided were not directly related or exactly parallel regarding the content or style:

> *What is provided as technology and technology related content or many activities are not connected to the contents directly. So, students can do some activities with ICT, but like that they cannot solve the problems in the text books. When students use GeoGebra, they can see how the graph changes as the dimensions change. They see and they understand. But, when the examples change into questions in the book, they cannot understand what the question means (K3).*

A S. Korean teacher (K4) emphasized that the teaching applications and contents must be used after they were properly tested in terms of security and ethics. He further noted that despite S. Korea having advanced technology, there was still a need for improvement in the use of safe and ethical content in schools. He also believed the necessity of training and establishment of special platforms to deal with challenges accordingly. He also proposed that the development of special programs that could be used in the schools would be another solution to the challenges, rather than the use of commercial applications. According to observations made in the schools, due to the language barrier and fast changing technological advances, In S. Korea, many applications find their peers developed in terms of the needs and established culture of S. Koreans. Popular chat applications, social media tools and more, usually had alternatives that appeal more to S. Koreans. For example, they used KakaoTalk app as a chat platform and South S. Korea's most popular search engine was Naver. Classting was a Facebook-like application adapted to the school environment.

Turkey

In total, 10 Turkish participants contributed to this category. Some Turkish participants (n=5) emphasized that the contents included and the programs used on the devices are far more important than the technology employed itself. Therefore, insufficient contents and applications limit the effective or advanced use of the devices:

> *The technology is easy to buy, but it requires a longer time to prepare a compatible content. Very experienced and willing people are required for this (T8).*
>
> *The equipment we use is the smart board. But the program here is much more important than the tool... Teachers want tablets that are different from what the students have. They want to have more programs on the tablet, so that they can use it more effectively. Those who do not use the tablets do not use them for this reason (T1).*

Most of the participants (n=7) from Turkey complained about that although the MoNE provided a platform (namely EBA), there was little content available and their quality was debatable. 2 of these participants explained as follows:

> *The biggest shortcoming is the lack of content. We're having trouble accessing the content… For example, we use the contents of the MoNE on EBA, but the resources there are not enough… There is not much to access. You only get to access the books of the MoNE. There are not many sources except e-books. They need to be updated. A teacher should be able to teach with the help of the content provided on EBA without the need for another source. Because not every teacher may prepare this content (T4).*
>
> *There should be more documents and contents on EBA in number; but these must also be of good quality. For example, the content about the course is prepared at the middle school level. I can not show it to any high school student here. Their quality should be a little better, there should be more documents on the platform, they should be immediately accessible, and the internet infrastructure should be fast (T10).*

Unlike the statements of the English and music teachers, an ethics and religious culture teacher (T7) and a technology and design teacher (T1) stated that they were satisfied with the provided content and there was enough number of it.

In the schools included in the FATIH project, teachers were trying to access the required course content via internet, when the content was not available on the platform (EBA) provided by the government. However, 5 Turkish participants emphasized that it was very difficult for the teachers to access the content whenever they want it instantly due to the internet censorship and content restrictions set by the MoNE. Exemplary statements were as follows:

> *Many websites are banned for no reason. These sites are banned, although there is nothing wrong with them. For example, we will have a look at the lyrics of a folk song, but it wouldn't open the web page as if there is a problem with the website. We're trying to look it up elsewhere. It's a bit waste of time (T8).*
>
> *The Internet must be available at schools, but because the MoNE has banned many sites, teachers can not access the things they want to use in the school. Everything is forbidden. Therefore, teachers do the research at home and bring the content with them later. But it would is still be useful to have the internet (T20).*

The participants (n=5) were mostly displeased about not being able to watch videos on YouTube. As there was no access to some websites like YouTube or programs, students were trying to change the settings of the tablets and the boards and breach the security measures by downloading illegal programs. Limited access to internet and programs on the tablets and boards seemed to be creating another problem.

4.3.2.7.2. Available Time

Available time referred to teachers' time spent on preparing materials for technological tools and the time they allocated for technology use in the classroom. Half of the Finnish participants claimed that preparing the course materials and getting ready for the class took a lot of time when a technological tool involved in the process. While trying to fulfill the strict curriculum requirements, preparing and presenting related course materials and dealing with technical problems that may occur in the classroom considered as a waste of time. They would prefer to focus on the lesson itself.

However, these facts did not prevent them from using technology. Because once they were done with the course material preparation or learned how to use the technology, it was not that much time consuming anymore. Although the participants mentioned such difficulties, the participants added that they did not give up using technology. Because, they knew that at first it would be difficult to adapt to it, but once they were prepared, these materials become time-saving.

Similar to Finland, in S. Korea, some participants mentioned that teachers needed to put considerable amount of time and effort for ICT use in the classroom. Preparation for upcoming lessons as well as incorporating technology in classroom was found too much time consuming. One of them stated that due to curriculum and school requirements that they needed to follow, there was not much time left for technology use. Another one explained that since teachers didn't have lots of time and had to fulfill their responsibilities, they would most likely give up on technology use and maintain a traditional way of teaching.

Similar to Finland and S. Korea, in Turkey some participants stated that they didn't prefer to use technology in the classroom due to their limited time. Having inadequate time to spend on thinking about how to teach a topic in any other way, or with different techniques, while having technical problems in the classroom, and not having enough documents and materials were the reasons why they preferred not to use technology. One stated that the government needed to provide pedagogical approach, materials and everything else required. Furthermore, even if teachers had the trainings regarding the use of some hardware and software, they wouldn't have enough time to practice what they had learnt. Once again, they needed to spend time to prepare relevant materials for the software, but this was not the case. They tend to chose ready to use materials. If there was not available materials, they would not have time to prepare one.

In Finland, S. Korea and Turkey, the mutual difficulty mentioned was not having available time to prepare relevant course materials and use them in the classroom as much. However, Finnish participants thought that even if it took some time to prepare, they would keep using technology because they believed that it would be worth it in the end. The materials were reusable and it would save time later. On the contrary, some S. Korean teachers would not put further effort due to time-management issues, so they kept going with the traditional way of teaching.

Finland

11 Finnish participants out of 19 said that it took a lot of time to prepare the course materials and make preparation for the class. Although the use of technology contributed a lot to the process of learning and teaching, some of them also thought that it was taking away some things at the same time in an intangible manner. Because teaching and learning with / about new technology, preparing and presenting related course materials while trying to keep up with a strict curriculum sometimes were regarded as a waste of time. Because they wanted to keep the lessons in focus and spend their time for that instead of wasting time with the technology related problems. However, these facts did not prevent them from using technology. Because once they were done with the course material preparation or learned how to use the technology, it was not that much time consuming anymore.

> *There is just a sentence that says "you should use technology". Yes, it is there but it is written that everyone should use, but how? None has time… You don't have time, you want to do something else, do it in night time or evening, for example I haven't prepare materials today and showed them a video (F8).*

> *Time for preparing materials, for doing things are not much. We have strict curriculum and so we have so much things to do (F13).*

> *At the beginning of learning something new, it takes time. When you do the materials like presentations on the computer or whiteboards, it takes time. But once you have them, then it doesn't much time to use them (F18).*

S. Korea

Similar to the statements of the participants from Finland, 6 S. Korean interviewees indicated that ICT use took a considerable time and effort of the teachers. They added that making preparations for the next class was also time consuming. One of them stated that even if the use of technology motivated students, teachers might avoid using it very often due to time management problems:

> *Of course, the effective participation of students in the class motivates me too. But there is also a difficulty in the use of technology, getting prepared for each course ahead in this way is actually not easy. So, I am only using ICT while I am explaining certain important points in a certain time period. Other than that, this difficulty can sometimes even cause me not to use it (K4).*

> *Lack of time is a barrier for integrating ICT into education in my lessons. School has to perform various events and also teachers have to deal with the events and they have to follow the national curriculum as well (K13)*

Interestingly, one S. Korean participant claimed that S. Korean teachers wouldn't prefer to use technology due to lack of time. They would stick to their own teaching methods that they are comfortable with.

> *It is important to know the development of the technology, but S. Korean Teachers have insufficient time to take full advantage of what they have learned. So they give up and maintain a traditional way (K17).*

Turkey

Similar to what the S. Korean and Finnish participants stated, some Turkish participants (n=5) also said that they did not use technology due to the lack of available time. A high school chemistry and mathematics teacher respectively explained this situation with its relationship to other determinants:

> *Time is the drawback for me, the reason that I can not use it [a technology]. Inadequate time, not being able to connect to the internet, not having enough documents and materials blocks technology integration. These [the devices in the class such as smart board] are not being used effectively. For this reason, they are not necessary, we used to do the same things with projector in the past (T10).*

> *...I am trying to teach depending only on my own pedagogical understanding and effort. I don't have so much time to spend thinking on*

how a topic could be taught in any other way, or with different techniques. The ministry needs to do it and submit it to us (T4).

One of them (T9) indicated that the teacher did not prefer to use technology, because even if they did take the trainings, they did not have enough time to practice mostly.

4.3.3. Summary of Micro Level Issues

A summary of Micro Level Issues was provided in Table 4.6. The summary displayed a very intense data and findings of a very detailed analysis that could be seen below in order to provide easy navigation and a rapid understanding of similarities and differences between countries. The numbers in parentheses showed how many participants mentioned the related issue, while the letter O refers to the observation.

Table 4.6. *The summary of Micro Level Issues*

Summary of Micro Level Results						
		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
Status of ICT Integration	ICT Skills Acquisition Process	Holistic Approach	ICT competencies as subject-specific learning objectives (16) No need for a separate lesson (3) Even if delivering content knowledge and ICT competency at the same time was time-consuming, it was effective (6)	Importance of holistic approach rather than having ICT competency as an isolated learning objective (5) The use of technology would be meaningful when integrated into the classrooms since it was a part of the whole (2)	The necessity of a holistic approach towards technology use (1) The lack of practice regarding the use of technology in the classroom (2)	• A holistic approach was adopted by Finland. Since the content knowledge and ICT competency shouldn't be delivered separately, a separate lesson was not necessary to acquire ICT competencies. • Even if S. Korea had independent courses including content of programming and basic skills, still ICT integration in the other subjects was not neglected. • In Turkey, the necessity of a holistic approach was indicated. Even if holistic approach was attempted to bring into classroom with the help of FATIH project, it didn't work since teachers didn't provide enough opportunity for the students to experience technology use.
		Independent Status of ICT courses	Optional ICT-related courses (14) knowledge and availability of teachers as well as upon students' request determining the courses (4)	There was not a subject dedicated to ICT literacy, but there were subjects, optional and elective courses that included objective to develop ICT	Necessity of more mandatory ICT-related courses (5) Necessity of ICT courses and teachers to have a standardized set of skills (5)	• Finland had an integrated approach, but still they offered point of interest courses based on knowledge and availability of teachers as well as upon students' request. • In S. Korea, there were independent ICT related courses that teach not only how to use technology, but also how

Summary of Micro Level Results

Themes	Sub-themes	Countries Categories	Finland	S. Korea Findings at first Glance	Turkey	Highlights of Comparison and Contrast
				literacy skills of students (5) Not necessary to have a computer teacher and ICT as a separate subject anymore, since everybody were able to use and learn how to use technology on their own (5)	Content of the ICT courses were not sufficient (2)	technology works. ICT competencies of students were at a certain level, so the participants thought that there were no need to pay attention on separate courses or intensive instructions on how to use it. • In Turkey, at elementary school level, there were separate ICT lessons. However, still there was a need for more mandatory courses and ICT teachers to reach a standard ICT competency level for the students.
		Responsibility of Teaching ICT skills	Each and every teacher were responsible (15) Each teacher made sure that students in their class had a certain standard of ICT competency (3) ICT specified teachers were more involved (3)	Homeroom teacher (7) All teachers (4) afterschool courses and private institutes (2) Students could learn ICT skills on their own (2) Teaching ethical use of technology (3)	Classroom teachers (4) ICT teachers (6) Subject matter teachers (1) Students were able to learn how to use technology on their own (4)	• In Finland, since there was not an ICT teacher, every and each teacher had the responsibility of teaching ICT core skills. In S. Korea, homeroom teachers, other subject teachers, technology teachers if there was any, teachers of afterschool and private institutions helped students to learn ICT literacy. Some participants also thought that students could learn on their own. Teaching ethical use of technology was the prior concern. • In Turkey, classroom teachers at primary schools, ICT teachers at elementary and high schools would be primarily responsible to teach core ICT skills. Since students had the basic ICT

Summary of Micro Level Results

Themes	Sub-themes	Countries Categories	Finland	S. Korea Findings at first Glance	Turkey	Highlights of Comparison and Contrast
						skills when they came to school, they would be able to learn different ICT skills on their own.
	Reasons of ICT use	Affordance	Enriching the learning experience of the students (5) Providing wider range of educational materials and extensive information online (6) Enabling collaboration and supporting collaborative learning (5)	Providing understanding of difficult/new concepts (3) Display of dangerous experiments that couldn't be done in the classroom environment (3) Providing authentic learning resources and unlimited information (3) improving students' collaborative abilities (6)	Enhancing learning experience of the students (6) Display of dangerous experiments that couldn't be done in the classroom environment (3) Quick access to a lot of information and resources through technology (5) Visualization of abstract concepts or making their lessons more visual (11) Saving time in the teaching and learning processes (4) Technology use increased the speed of the course (3), but this didn't mean this not necessarily increase the success of the students (1)	• Enhancing learning experience of the students with the help of technology was the main focus in each country. The participants from each country also pointed out that technology provided access to a wider range of educational materials and extensive information online. However, improving students' collaborative abilities through technology use was only mentioned by S. Korean and Finnish participants. Visualization of abstract concepts or making their lessons more visual was the focal point of Turkish participants.

Summary of Micro Level Results

		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
		Diversifying the methods	Technology use diversifying and enhancing teaching and learning methods (15) Technology use making teachers' job easier (7)	Technology use diversifying and enhancing teaching and learning methods (4) Providing more available tools to be used for learning activities (10) Diversification of the way of delivering the content (5)	Diversification of the way of delivering the content, and concretizing the abstract concepts (13)	• The Turkish participants claimed that the use of technology would diversify the way of delivering the content, and concretizing the abstract concepts, in contrast to S. Korean and Finnish participants' claimes that technology use diversifying ways of instruction methods. Turkish participants stated that by diversifying the way of delivering the content, they aimed to increase the time period that the informaiton learned by the students remained permenant.
		ICT as an optional tool	Technology use when necessary (16) ICT was only a tool for both teachers and students to accomplish their goal in the learning and teaching processes (10) Trial and error method (8)	The use of ICTs being a tool instead of the course objective (7) The nature and objectives of a subject would determine the technology use (8) content and objectives of the lesson, and availability of the tools would determine what would be used for delivery of the lesson (6)	ICTs were just a tool (5) They should be used only when necessary (9) The requirement of the subject and needs of the students would determine technology use (3)	• In Turkey, similar to Finnish and S. Korean statements, Turkish participants also drew attention to ICTs being just a tool for teaching and learning process only when it was required to use based on needs of the students and objectives of subject. Only Finnish participants suggested that they would experiment and discover the tool to see whether it would be beneficial for the learning process then they would decide to keep incorporating it in the classroom.
		Motivator	The use of technology by both	The technology was used to improve	ICT use in the classroom improved	• In each case, technology use would improve students' motivation.

Summary of Micro Level Results						
		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
			students and teachers helped learners' learning processes by motivating them (12) The motivation of students to use ICT in the classroom was a facilitator of ICT integration (4)	students' motivation and gather their attention (6)	students' motivation (5)	
	Misuse of Technology		The importance of students' self-regulation over the technology use (6) Providing enough freedom to use technology would help students to learn self-regulation (5) Students' ability to use technology were mostly limited to entertainment purposes (4) Too much technology use would interrupt	The existence of technology addiction among student s (2) Difficulties in teaching moral issues regarding the use of technology (1) the technology could prevent the learner from focusing on the content (4) Students were capable of using technology only for non-educational proposes (2)	Students didn't see technology as a learning tool, it was rather an entertainment tool for them (6) Non-educational use of technology (4) The moral and ethical issues of technology use (cyberbullying, research ethics) (5) Technology being distractive- students' ineffective self-control over the use of their devices (7)	• In each country, the ability of students' non-educational use of technology were better than their use of technology for learning activities. Difficulties in maintaining focus on the context while using technology were reported in each country. Only in Turkey and S. Korea, the concerns related to the existence of technology addiction among students were revealed. Some Finnish participants expressed their concerns about that too much technology use would interrupt students' face-to-face social interaction. • Only in Turkey and S. Korea, the moral and ethical issues of technology

Summary of Micro Level Results

Themes	Sub-themes	Countries / Categories	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
			Findings at first Glance			
			students' face-to-face social interaction (2) Students losing focus (1)		Technology addiction (3) Technology use could sometimes kill their creativity (3)	use were defined as misuse of technology. • While Turkish participants complained about students' lack of self-control over the use of their devices, Finnish participants expressed the importance of students' self-regulation over the technology use. Furthermore, Finnish participants suggested that providing enough freedom to use technology would help student to learn self-regulation.
Teacher-related Aspects	Teacher Autonomy		Very autonomous in their professional work (12) It was up to teachers to choose the use of technology to accomplish the goals (9) Teachers' autonomy was limited to the requirements of the curriculum (4)	Having control and responsibility over their work (10) Teachers didn't need to choose teaching with technological tool over alternative ways of teaching anymore since everybody had certain level of ICT skills (2) The misuse of autonomy (1)	Making autonomous decision s about how they teach in the classroom (10) Teacher's discretion would define the technology use since there was no curricular limit or policy (3) The availability of technology does not mean that it will be used (3) The misuse of autonomy (4)	• In each country, the teachers were autonomous in their professional work. They would decide weather technology was necessary to use in the classroom. Only in S. Korea and Turkey, the participant drew attention to possible misuse of autonomy: not to choose the use of technology to accomplish the goals at all. Only in S. Korea, some participant thought that teachers didn't need to use technology in the classroom anymore since teachers and students had a certain level of ICT skills.

Summary of Micro Level Results

		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
	Personal Interest		Personal interest of the teachers could determine their ICT use in the learning and teaching processes (18) Their personal interest motivated them to put effort into learning and exploring new ways of ICT use for educational purposes (6) The ones who had interest in ICT use would like to find new ways of teaching with ICTs (3) Necessity of encouragement and time for the ones who didn't have interest in ICT use (2)	The teachers who were more interested in ICT use would likely to utilize technology in the classroom (15) The ones who had the interest would try to learn or take relevant courses (6) S. Korean education was teacher-centered, only a change in teachers' mind-set would help technology integration (1) The need for learning new systems as a burden (1)	Personal interest of teachers in ICTs could promote technology use in the classroom (9) Self-learning and self-effort for appropriate technology use were depending on teachers' interest (5) The presence of uninterested and unwilling teachers was a barrier to technology integration (8) Teachers' private life, busy workload and their desire to access to information without any effort were possible reasons of teachers' lack of interest and effort (3)	• Most of the participants from each country agreed that for technology integration, teachers' interest in technology use were primarily required. Teachers' interest would trigger them to learn more about technology and implement them. • Only Finnish participants suggested that encouragement and time were needed to be provided for the ones who didn't have enough interest to use technology. • In S. Korea, one of the participants mentioned the necessity of change in teachers' mind-set for technology integration, because S. Korean education system was teacher-centered. Additionally, sometimes teachers would see learning something new as a burden since they were not interested in it. Turkish participants defined the presence of uninterested and unwilling teachers as a barrier to technology integration. Additionally, teachers' private life, busy workload and their desire to access to information without any effort were possible reasons of teachers' lack of interest and effort.

Summary of Micro Level Results

		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
	Pedagogical Approach		The importance of pedagogical approach underlying the use of technology (14) The necessity of change in the pedagogy for technology integration (4) Teachers collaborated and shared their ideas/materials/ experiences in order to improve their technology use for educational Purposes (3) Learning with/from students (6) Peer-learning as an educational practice (8)	Identifying adopting pedagogical approach more important than the use of technology itself (5) Teachers should teach the way they knew the best (1)	The importance of pedagogical approach while integrating technology(6) A need for change in teaching philosophy for technology integration (3) The use of technology may not be effective if the correct approach is not selected (1) Technology integration required a combination of teacher's pedagogical and technological knowledge (1) Focus on how to deliver content via technology rather than how to make the teaching experience more effective for the students (3) Being open to learning from students (7)	• The participants from all the countries agreed that adopting a pedagogical approach regarding the use of technology was more important than just learning how to use the technology itself. Turkish and Finnish participants pointed out that the process of technology integration required a change in the pedagogical approach. Only Finnish participants mentioned that they did collaborate and share their ideas/materials/ experiences in order to improve their technology use for educational purposes. • Finnish and Turkish participants were open to learn new things from/with students, because they thought some students could have better ICT skills. Additionally, peer-learning as an educational practice was employed in Finland. • In Turkey, the focus on how to deliver content via technology was stronger rather than how to make the teaching experience more effective for the students.

Summary of Micro Level Results

Themes	Sub-themes	Countries / Categories	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
			Findings at first Glance			
	Role of Teacher		A facilitator rather than a director of learning (11) Transformation from a traditional knowledge provider to a facilitator who guides the learning process of students (2)	Guiding the students to gain the understanding of technology ethics (3) Creating tools and delivering appropriate learning recourses (9)	Teachers should know everything (1) A teacher-dominated approach, facilitating their teacher-centered instructional methods (7) the role of teacher as a guide (4) the role of teacher as a role model (7)	• The description of teachers' role in the process of technology use in the classroom showed differences amongst countries. While Finnish participants defined the role of teacher as a facilitator of the learning in the process of educational use of technology, S. Korean participants attributed three roles to the teachers: guiding the students to gain the understanding of technology ethics, creating tools, and delivering appropriate learning recourses. From the discourses of Turkish participants, two divergent and conflicting definition of the teachers' role emerged: facilitating their teacher-centered instructional methods with a teacher-dominated approach, and being a guide/role-model.
	Teacher Resistance		Lack of technological and relevant pedagogical knowledge (12) Age (4) Training and collaboration would	Lack of relevant pedagogical knowledge (3) Sticking with their old practices, not feeling like learning new things due to thinking their	Insufficient technical and pedagogical knowledge (6) Elder teachers struggled to change their way of doing things when new technologies and	• The participants from all the countries agreed that insufficient technical and pedagogical knowledge would make teachers to show resistance to use technology. Turkish and Finnish participants particularly mentioned that elder teachers didn't prefer to use technology in their

Summary of Micro Level Results

		Countries	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
Themes	Sub-themes	Categories		Findings at first Glance		
			remove the problem (2)	education was enough (3) Age (1) Teachers’ mind-set (1) They didn’t know if technology really improved students’ learning (1)	techniques introduced (5) Being busy with paper work (1) Not being open to change (3) Age- getting-close-to-retirement (6)	classroom. Turkish participants linked this situation to teachers not being older and getting close to retirement. Additionally, they pointed out that it was difficult to change pedagogical practices for older teachers. The same situation highlighted by some S. Korean participants as well. They thought that teachers preferred to stick with their old practices. They did not feel like learning new things due to thinking their education level was enough. • Only Finnish teachers suggested that this issue would be removed with the help of trainings and collaboration.
	Teacher Motivation		Preparing students for the future in terms of skills that would be required (8) Students’ positive feedback (7) Improving their teaching as well as students’ learning experiences (4) normal to use technology in the	A part of students’ daily life (3) Desire to be a role-model (1) Teaching right way of using technology (1) Sharing (1) The use of technology was a tool for showing off (1)	Students’ positive feedbacks (10) enhancing students’ learning experiences (8) Self-motivation/interest (6) Ensuring ICT capabilities of students as requirement of this	• Most of the Finnish participants claimed that their motivation was driven by students’ positive feedback as well as their own desire for ICT use. S. Korean participants were more focused on teaching how to use technology in the right way, since they believed that the students were often using technology in their daily life already. The motivation of Turkish participants were mainly based on getting positive feedback from students as it was for Finnish participants.

Summary of Micro Level Results

Themes	Sub-themes	Countries Categories	Finland	S. Korea Findings at first Glance	Turkey	Highlights of Comparison and Contrast
			classrooms since the students had been using technology in their daily life (4) Creation of “good” future citizens (2) Keeping up with the change (3)		era and for the sake of their future (4) Feeling responsible (2) Keeping up with students (2)	However, they also claimed that students needed to learn how to use technology for their future as requirement of this era, so they felt responsible of teaching them. Similarly, Finnish participants indicated that they felt motivated to use technology, because students would be prepared for the future in terms of skills that would be required by incorporating technology in classroom.
	Teachers' use of technology		iPads, Apple apps, and cloud services extensively more than computers and laptops Google services and apps for communication and collaborative work showing visuals on the projector, using editing, word processing and social media tools as well as utilizing specific web-based subject-matter apps (6)	Internet for searching information and reaching subject-matter content/materials on the computer or smart phone The presentation software such as PowerPoint commonly used PowerPoint, Prezi, Movie maker, YouTube, Audacity, Google survey, Google drive, multimedia (i.e. music, photo, video clips, etc.), Scratch, etc. (10)	Projection, smart board (if the school was involved in FATIH project), computer, CD, and smart phone as hardware, EBA, word, and PPT as software common use of presentation tools only delivery of ready-made materials (4) The purpose of smart board use was limited to showing digital versions of	• In Finland, collaborative interactive tools, • IPad, Google services and online platforms were used. • In S. Korea, internet was used for information search, and reaching out content/materials. Presentation tools were commonly used. Mirroring devices, skype, and broadcast were also mentioned to be used. • In Turkey, similar to S. Korea, internet was used for information search and reaching out content/materials as much as regulations allowed. Smart boards, projector and laptop were used, but not the tablets. PPTs, multimedia materials were commonly used.

Summary of Micro Level Results

Themes	Sub-themes	Countries Categories	Finland	S. Korea Findings at first Glance	Turkey	Highlights of Comparison and Contrast
			Kahoot and Sokrative [quiz apps] were most popular apps use social media tools (Facebook, Twitter, and WhatsApp) as well as Nearpod using for pre and post course work (3)	mirroring devices, skype, and broadcast (3)	textbooks, displaying PPTs, watching YouTube videos, and providing the subject-relevant exam questions on the screen (8) no use of tablets	
		Available Content	e-learning environment-PEDAnet-developed by Finnish developers(5) The transition from the use of hard copy materials to the use of digital materials (3) Compatibility issues (2) The sustainability of applications (1) The educational e-materials inadequate and the material	The necessity of constant up-to-date material (1) The testing materials and digital teaching materials provided were not directly related or exactly parallel regarding the content or style (1) A need for improvement in the use of safe and ethical content in schools (1) Developing special programs instead of using commercial apps (1)	Content and programs more important than technology (5) Little content available on EBA and their quality was debatable (7) Dissatisfaction with the content (2) Internet censorship and content restrictions (5) Unwanted behaviors of students due to limited access to internet and programs (5)	• Finnish and Turkish participants in particular found available content insufficient in terms of amount, diversity and scope. A S. Korean participant highlighted the necessity of having up-to-date materials and provision of safe and ethical content. • In Turkey, internet censorship and content restrictions undermined the process of technology use in the classroom. In S. Korea, a teacher said that teaching with technology did not always help students to solve their exam questions.

Summary of Micro Level Results

Themes	Sub-themes	Countries / Categories	Finland	S. Korea	Turkey	Highlights of Comparison and Contrast
			Findings at first Glance			
			preparing process so much time consuming (11)			
		Available time	Preparation of materials were time-consuming (11) Using technology in the classroom while fulfilling curriculum requirements could be a waste of time sometimes	ICT use took a considerable time and effort of the teachers (6) Time-management problems (6)	Available time limits their technology use in the classroom (5)	• In Finland, S. Korea and Turkey, the mutual difficulty mentioned was not having available time to prepare relevant course materials and use them in the classroom as much. However, Finnish participants thought that even if it took some time to prepare, they would keep using technology. The materials were reusable and it would save time later.

4.4. Visual Presentation of the Findings

A figure was drawn in order to present the relationships between themes and sub-themes that findings indicated. The levels defined within the boundaries of a Multi-Level Ecological Perspective (Zhao & Frank, 2003) were displayed as intertwined since none of them could be clearly isolated from each other. While guideline principles and school were drawn with continuous line, classroom, technology use, and teacher community were outlined with same type of dashes. In this context, continuous line referred to a more solid structure. Dashed line was representation of a permeable structure. While continuous lined shapes were more difficult to change, dash lined shapes were more open to external influences. Additionally, determinations of ICT use had a different type of dashed outline, because it was originated from guiding principles but had an impact on school and classroom environment regarding technology use. The outermost thick rectangle and the arrow attached to it symbolized that all themes and sub-themes somehow had an impact on the use of technology in the classroom. Additionally, double-headed arrow showed mutual interaction. An arrow pointed to more impact and control area in the direction indicated. Dash lined arrow was representation of interaction that could get affected by the surroundings. Figure 4.1 below presented themes and sub-themes of all levels. Categories were excluded not to create confusion.

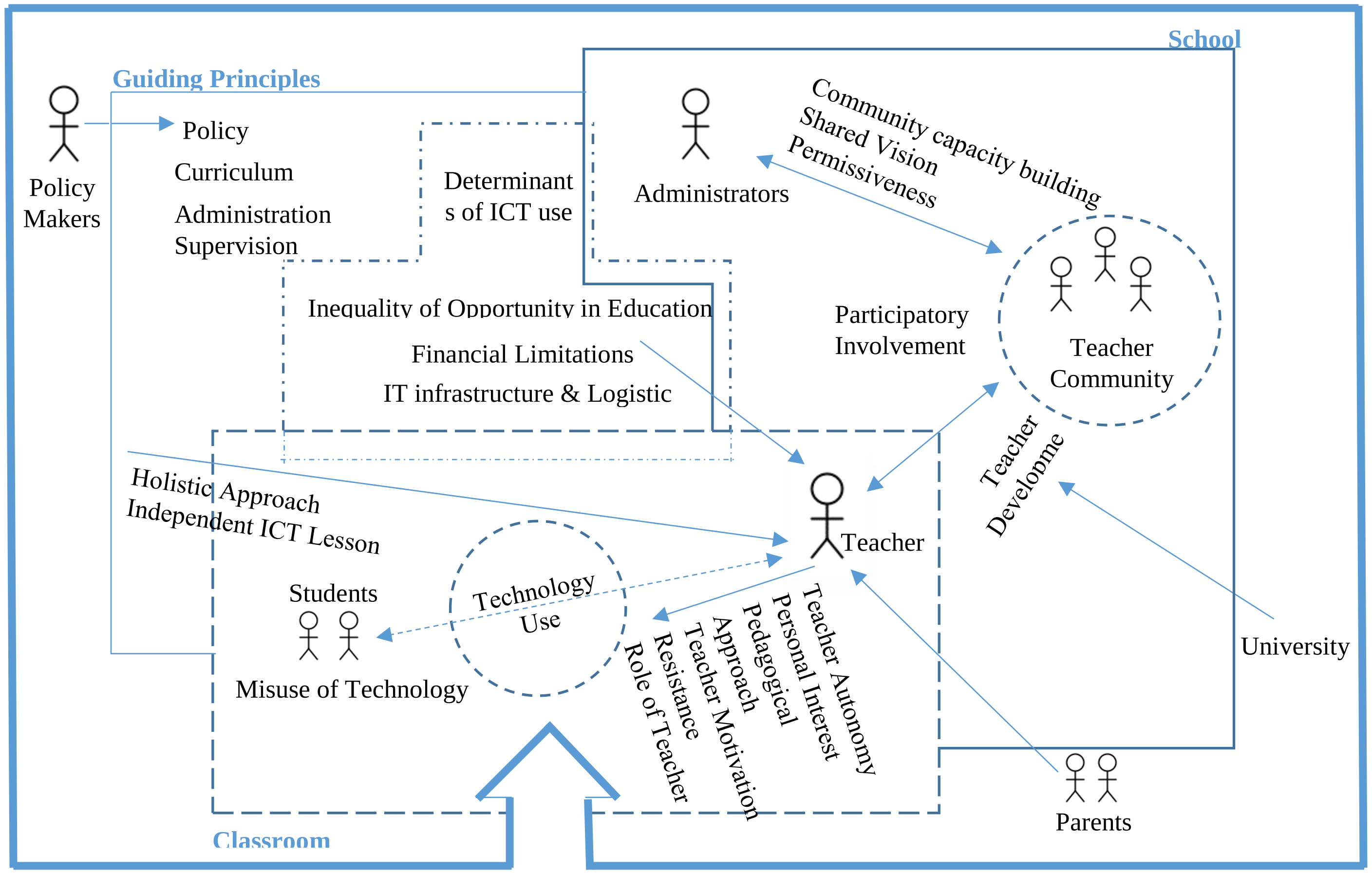


Figure 4.1. Visual Representation of the Findings

CHAPTER 5

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

The findings of the study are discussed in this chapter in reference to the research questions. Based on body of knowledge and literature available regarding the subject, the major findings are presented. At the end of the study, a conclusion is drawn in order to contribute to educational practices. Some opinions are shared regarding how to apply the implications obtained as a result of this study into the policies and practice in real life. Later, some suggestions concerning further and future research are made in addition.

The differences and similarities amongst Turkish, Finnish and S. Korean education systems in terms of the aspects affecting ICT integration in classroom practices within the boundaries of a Multi-Level Ecological Perspective (Zhao & Frank, 2003) were investigated and analyzed. The aspects affecting ICT integration were explored within a multi-dimensional framework that incorporates regulative, institutional and contextual levels in order to demonstrate the patterns and relationships among the countries observed. By comparing the status of other selected countries with the current state of technology integration in Turkey, it was intended to convey the conclusions derived from the experiences and statements of teachers working in different countries. This way, it was aimed to discover opportunities for improvement regarding technology integration in Turkey.

A comparative case study approach was employed. With the help of semi-structured interview method and direct observations, perceptions of the teachers and principals regarding the ICT integration in terms of teaching and learning processes were uncovered. Data were collected from 60 participants in total: The number of Finnish participants were 19 and the number of S. Korean participants were 20, while the number of Turkish participants were 21. Additionally, the relevant documents collected, field notes and photos taken during the observations were also reviewed in order to provide additional data to support the conclusions derived from the interviews and direct observations. Finally, a rigorous, yet inductive and thematic analysis was performed in order to determine, interpret and address patterns based on the available data. Emerging themes and sub-themes were organized and listed under macro, meso and micro levels in order to answer the research questions.

5.1. Major Findings and Discussion

The nature of the comparison study and the relevant research questions required presentation and discussion of differences and similarities in the light of the mentioned framework in which the findings are reported. Additionally, the major findings of the study were presented in line with the interactions amongst the levels and actors visually at the end of the "Findings" chapter. The meanings of the findings were contextualized by relating them to previous research studies available.

5.1.1. RQ1. What are the differences and similarities regarding the aspects affecting ICT integration in classroom practices among Turkish, Finnish and S. Korean schools?

The similarities and differences are presented and discussed below evaluated at each level namely macro, meso and micro levels. Although each and every aspect makes for an intertwined, inseparable structure together, this method was used in order to present the findings of a qualitative research with the help of a framework in a more organized way.

5.1.1.1. RQ1a. At macro level

The macro level issues include guiding principals and their implementations, financial issues and their possible solutions, infrastructure, maintenance and support.

5.1.1.1.1. Guiding principals and their Implementations

Adopted Approach for Policy Implementation

First of all, the nationwide strategic plans, operational policies, curriculum and regulations may encourage the use of technology in the classrooms depending on to what extent they are understood and implemented. National policies and programs can be a starting point and a tool to obtain desired outcomes from ICT use in education (Kozma, 2008). However, while they make the required change possible in an educational system, they do not guarantee their successful implementation and the creation of the expected impact accordingly (Tyack & Cuban, 1995). As expected, the instructional implementations of national ICT policies were different in each country involved in this study, because they had fundamental differences in the policy related and strategic angles.

Countries' governance, institutional structures and policies would determine the way technology is used in the classroom. While policy making and management styles of Finland are flexible and decentralized, they happened to be more strict and centralized in Turkey. In the case of S. Korea, there were attempts to increase the decision-making ability and authority of local institutions, but still a centralized governance in education was observed dominant.

As one of the outcomes of a decentralized governance, the Finnish education system allows local decision-making. For example, local municipalities are entirely responsible for ICT integration in schools, and they can make decisions by taking local characteristics into consideration. In this context, there is not a policy that specifically targets ICT use in education, but there is a national plan for educational use of ICT that produces strategic policies and proposals in order to promote meaningful and collaborative learning. In parallel with the strategic policies, the findings showed that a collaborative use of ICT in a well defined network as a part of the instructional approach was prominent in Finland. The instructional implementation of strategic policy for educational ICT use could be clearly observed in the classroom environment in Finland. This cannot be explained only by the effect of the strategic policy, but by a combination of the social and economic rationales of their national policy. Because, Finland focuses on collaboration and knowledge sharing within the information society in order to reinforce the social impact of ICT and promote a productive economy (Kozma, 2008). It was not surprising to see the reflections of their vision in the field of education too.

On the other hand, S. Korean government have been managing technology integration in education with the help of comprehensive master plans. Within the scope of educational master plans incorporating ICT use, evaluation and research happen to be considered as crucial approaches for the Asian countries such as China, Japan, Singapore, and S. Korea that are entitled as developed countries (Ra, Chin & Lim, 2016). Within the framework of these master plans, coordination, planning, and implementation of the national ICT policies are carried out with the strong cooperation of MEST, KERIS and MPOEs. Unlike in the case of Finland, the findings of this study indicated that less collaborative, and more teacher dominant use of ICT took place in S. Korea even if there were policies set and institutions that cooperated for the implementation of them. This study produced findings which corroborate the findings of Shin, Han and Kim's (2014) study in a way. Their findings indicate that the policies determined did not affect the technology use in the classroom significantly in S. Korea, instead, it changed their pedagogical beliefs in time. And they explained this finding with that the policies would eventually change the teachers' belief systems and their practices since they already changed the curriculum, school support and the infrastructure in time. We may be faced with this kind of result because the interviewed and observed participants may still be in the transaction phase.

Similar findings were found in the case of Turkey, even if an information society strategy and action plan were developed and executed. Additionally, the authority and responsibility of the three separate institutions in S. Korea is undertaken by YEGITEK alone (The Directorate General of Innovation and Educational Technologies) in Turkey. It is doubtful that how effective an institution can manage large projects and implement its requirements alone itself. According to the findings shared in Gök and Yıldırım's (2015) study, the in-service trainings, incentives, rewards related to the implementation of the project, tracking of the project and teachers' involvement weren't found sufficient by the teachers.

The existence of policies and institutions that facilitate implementation of the policies didn't always appear to be necessarily helpful for the realization of them at the classroom level. The reason for this situation could be explained with three reasons: (1) Top-down perspective on policy implementation, (2) the discrepancy between theory and practice, and (3) lack of involvement in the process of policy setting.

Firstly, top-down perspective on policy implementation is considered effective only when the goals, guidelines, assessment tools are well defined and the capacity and commitment of implementers are ensured. The lack of a set of clear directives and goals that would create a shared vision is the most problematic aspect of the top-down perspective. As Yıldırım's (2007) study revealed that in the process of introducing a new technology into education environment, well defined goals, policies and roadmaps were desired by the teachers in order to accomplish the main objective. Contrary to the expectations, the Turkish participants did not explicitly refer to the need for a well-defined policy and roadmaps. But, the findings indicated that, for teachers to believe that there were problems in terms of the planning and implementation of the FATIH Project, obligation to grant the required permits from the school management and the higher authorities makes the response time longer in order to meet the needs and requests and the inability to make decisions on a local level can be considered as the results of a top-down perspective. Well-defined roadmaps and implementation methods are required along with the reinforcement of the autonomy at the school level and the enhancement of decision making responsibility in local. Even if Turkey and S. Korea have similar perspectives regarding policy implementation, S. Korean government is specifically working to increase the power and responsibility of local authorities to some extent as distinct from Turkey's approach (Lee & Park, 2014). Moreover, S. Korean government carries out their work and implementation process of the projects based on related research data (Ra et al., 2016). These two distinctive way of implementation may explain the difference between the success levels of these two countries.

Secondly, the discrepancy between theory and practice can also be explained as a result of shortcomings in terms of clear goals and roadmaps. In connection with this matter, the findings indicated a gap between policies and their implementations in each case. In Finland, the policies set regarding technology integration were found satisfying and optimistic yet difficult to implement. Additionally, the evidence derived from this study suggested that the goals set by the government were found very high and abstract. Although the presence of a difference between theory and practice was reported, this appeared to be due to the high expectations of the teachers from themselves. Because, they saw technology integration as a constantly evolving process that was open to improvement all the time. There was never a perfect practicing of it. Although, high-level goals in the ICT related policies required certain commitment and effort from teachers and principals, they still appreciated national steering. It maybe that the national policies were highly trusted and valued in Finland (Halinen & Holappa, 2013).

Similarly, the findings suggested that there were similar issues related to the implementation of policies in Turkey and S. Korea: The gap between written policies and their practices. But, the reason of this gap was originated from different shortcomings in both countries. The findings showed that while, lack of sustainable operations and maintenance practices were causing this gap in S. Korea, rapid changes in the policies, the lack of planning and technical support and the resistance of the teachers against proper application distanced the practice from the goals of the policies in Turkey. In consistent with the study of Yıldırım (2007), lack of stated goals and expectations related to ICT and lack of timely and effective technical support provision was found as the obstacles against the effective integration of ICT in Turkey. The participants in this study suggested that schools should have the authorization to make decisions on their own in accordance with their own needs instead of the Ministry adopting a centralized approach for decision-making process in order to overcome this barrier. Making room for the decisions taken at the local level -as in Finland and as attempted in S. Korea- and creating a balance between top-down and bottom-up policy implementation approaches may perhaps help to reduce this gap in Turkey.

Thirdly, lack of involvement into the process of policy making may hinder technology integration process. Because, the practitioners of the specified policies may not adopt them sincerely since these policies are in fact imposed from the outside without their actual involvement or participation in the process of policy determination (Kozma, 2011). In Finland, active involvement and participation of policy makers, local administrators, principals, teachers, parents and students were encouraged in decision-making and implementation processes of any strategic and operational policy. The approach adopted by Finland in the formulation of policies could set a good example for Turkey. The findings of Gök and Yıldırım (2015) support this view further that YEGITEK administrators weren't responsive to teachers' needs and requests regarding ICT use in schools. Therefore, teachers did not feel like they were a part of ongoing project, namely, FATIH project (Altın & Kalelioğlu, 2015; Gök & Yıldırım; 2015). In S. Korean case, there was no evidence regarding active teachers' involvement provided by the participants, but it is known that there has been some effort for increasing stakeholder participation in school education in order to support more decentralized mode of governance. For instance, the formation of school management committee was the indication of a system where the school autonomy and school based management start to prevail (Lo & Gu, 2008). The committee was composed of teachers, community members, parents as the official members and the school principal also took part as an ex officio member. However, establishing the balance amongst stakeholders’ autonomy over school operation was challenging due to their different interest. Moreover, this given autonomy is criticized with still being heavily under government control (So & Kang, 2014).

Testing policies

It is fundamental to note that in all three cases of this study, the testing policies forming the examination system and the importance of the examination in the education system had an impact on teachers’ ICT use. However, while it acted as a catalyst in Finland, it was a hindrance in S. Korea and Turkey due to differences in the policies. In Finland, test runs for an online examination system at high school level were being handled at the time of this study conducted. Thus, participants agreed that students needed to know the general ICT skills for sure so that they could be ready for this online tests when the time comes. The ongoing change in testing policies encouraged teachers to incorporate technology into the classroom in Finland. Additionally, the study didn’t detect any negative comment or pressure regarding an online final exam application. This finding is in line with the finding that Finland’s education system is not exam-oriented (Pollari, Salo & Koski, 2018). It is not a criterion of learning for teachers that the students answer the questions correctly. They mostly focus on students' conceptual understanding of the subject. When considered from this point of view, it wasn’t an exceptional situation that ICT was taught through utilization in education.

In S. Korea especially in high school, the existence of a more traditional teaching and learning culture was expressed by a few participants. While this study was carried out, it was very difficult to observe the classes in high schools and to make interviews with high school teachers. Those who didn’t accept to participate in the study justified the refusal of their involvement by being so busy and their desire to avoid distractions in an intense study environment. Similarly, in an elementary school, the findings revealed that although students were trained with technology, this didn’t help them solve the questions on the written exams. In S. Korea, student success is still associated with high scores obtained in the university examination (Kwon, Lee & Shin, 2017). In

Turkey, similar to S. Korea, traditional type of written exams are still in practice. In high schools, preparing students for exams was a notable part of teachers' responsibilities, but they were not worried about observations made in the classrooms. Just a few teacher shared their concerns about being not sure about whether the use of technology increases success in the exams or not, in turn, they were questioning the necessity of technology use. There are studies in other countries showing that exam-oriented society and teachers who have a mind-set of learning and teaching for high scoring purposes in exams were posed as obstacles against effective and full use of technology in the classroom (see. Demetriadis et al, 2003; Lim & Chai, 2008).When the aim of the education is to get high scores from the exams, the methods and tools that do not serve this purpose might be eliminated even if they help the actual understanding of the subjects. The importance given to the examination should be given to the process as well. Exam policies need to be reviewed while making reforms regarding technology use in education (Tarman, Baytak & Duman, 2015).

The Challenges of Curriculum Implementation

In each country, the curriculum was flexible and undetailed in terms of tools and methods that can be used in the classroom. In the current study, the design of the curriculum was found to influence technology integration in education in different ways in each case. While, the ambiguity across the curriculum was an issue for technology integration in Finland, having to cover a very intensive content was a barrier to technology use in Turkey. In S. Korea, some participants pointed out that the emphasis on ICT use in education was not much anymore, so they did ignore the determined course hours (10% of the total course hours) regarding technology use by the curriculum. But unlike what participants said, Shin (2015) explained this issue from a different perspective. He argued that this obligation did not take into account teachers' beliefs about education, or their attitudes or competencies in using technology. Therefore, S. Korean teachers have not fully accepted the changes brought by technology integration anyway. This can be said to be similar to the cause of the problems encountered when teachers are fulfilling the requirements of the curriculum, integrating the use of technology into it and implementing the FATIH project. Since, in Finland, the parties participate in the process by taking joint decisions, the situation can not be marked as the same with the cases of Turkey and S. Korea. The practicing process of the decisions, strategies and policies differs.

The ambiguity can give teachers the flexibility to act in line with changing needs. In addition, they can adapt to rapidly changing technological tools with the help of flexibility. However, the ambiguity also may cause teachers to avoid the use of technology in the classroom. According to our findings, while this situation made it difficult for Finnish teachers to integrate technology into the curriculum, this caused S. Korean teachers to avoid using technology at all. This behavior of S. Korean teachers may also indicate misuse of autonomy in the classroom.

Unlike in S. Korean and Turkish cases, Finnish schools had their own school curriculum in accordance with the national curriculum. Even if the findings revealed difficulties in making decisions regarding ICT use in the classroom due to lack of clear boundaries and guidelines in the current curriculum in Finland, the school curriculum helped teachers' decision-making process since it included concrete and practical interpretations of national curriculum (Halinen & Holappa, 2013). These interpretations were supported by strategic plans at the city and school levels in order to provide a mutual understanding and constitute a standard for implementations. On the other hand, the findings didn't suggest the presence of a strategic plan, a vision or any curriculum at school and city level in both S. Korea and Turkey. This could be explained by their centralized and top-down management systems. Because, the educators and administrators are not able to respond to the needs immediately since they are not authorized to make decisions at the local level, and their decisions need to be approved by the higher institutions. Therefore, it is difficult to form a school curriculum or guidelines in order to provide concrete and practical interpretations of national curriculum.

Interestingly, different from Finland and S. Korean case, a very intensive content at high school level reported to be a barrier against use of technology in Turkey. Because, the findings suggested that there was no time left for the use of technology while fulfilling the intensive requirements of the curriculum within the given limited time. This finding is in agreement with Unal and Ozturk’s (2012) and Gök and Yıldırım’s (2015) findings which showed inadequate time was identified as one of the barriers regarding the use of technology in the classrooms. In order to overcome this barrier, in Yıldırım’s (2007) study the participants (n=45) indicated that the curriculum had to be reorganized in such a way that it will provide sufficient time and space for the use of technology. To focus on the content much may promote the use of teacher-centered educational methods (Dicolen, 2017). S. Korean participants didn’t clearly point out any information regarding the intensity of curriculum, but they complained about their workload as it was also reported by Dicolen (2017).

Summary of this Section

- Each country’s approach to ICT policy implementation was different due to their governance styles, institutional structures and adopted policies. While two completely contrasting governance styles were observed between Finland and Turkey, S. Korea was kind of in the middle in terms of their autonomy sharing, decision-making rights and implementation flexibility at the local level.
- Although Turkish and S. Korean governance styles were the same in essence, there were differences in practice. S. Korea's centralized understanding of education was tried to be changed by increasing the autonomy of local institutions and supporting the school management committee. In Turkey, The centralist understanding that also had an impact on ICT policy practices remained unchanged and no attempts to alter it were observed.
- In Finland, there was not a specific policy related to ICT use in education, but strategic policies and proposals regarding the educational use of ICT were

generated within the compass of the national plans emphasizing collaboration and knowledge sharing within the information society in order to reinforce the social impact of ICT and a productive economy. In S. Korea, some comprehensive master plans were designed to create and manage the strategic and operational policies regarding the technology integration process. In Turkey, an information society strategy and an action plan were developed and executed. The most significant operational reflection of these strategy and plan was the FATIH project.

- In S. Korea and Finland, the responsibility of educational planning, coordination, implementation, evaluation and research were shared among government agencies or institutions from different hierarchical levels. In Turkey, corresponding responsibilities were undertaken by only one government institution alone.
- A top-down perspective on policy implementation, the discrepancy between theory and practice, and lack of involvement in the process of policy making were listed as possible reasons of different policy practices in each country.
- Lack of trusted and considered national values, well-defined roadmaps and implementation methods, a shared vision, sustainable operations and maintenance practices, room for the decisions taken at the local level, involvement in the process of policy making, response to teachers' needs and requests regarding ICT use, stakeholder participation in school education were the shortcomings that may hinder the realization of the existence policies at the classroom level.
- The purpose of teaching and learning differed fundamentally for each country. Finland put emphasis on students' conceptual understanding of the subject, while S. Korea and Turkey had a mind-set of learning and teaching for high scoring purposes in exams.
- Teachers' limited use of ICT may be explained by the testing policies in the education system. While Finland was trying to switch to computer-based

college exam applications and making trials accordingly, traditional type of written exams were dominantly applied in S. Korea and Turkey. Obviously, the computer-based collage exams would require students to have ICT skills to some extend as a prerequisite. In S. Korea and Turkey, according to the claims of teachers, when the students were canalized to use technology while learning the subjects, they had hard time to adapt solving the problems in the paper based classical exams and their success were adversely affected as a result. Since the education system was mostly exam oriented and teaching the subjects via technology assisted means did not serve the purpose of high levels of success in the exams, the educators in these countries were less likely to integrate technology into everyday learning process of the pupils.

- In each case of the study, the curriculum provided flexibility for teachers in selecting tools and teaching methods. But, available ICT related objectives and statements in the curriculum were criticized for being undetailed and superficial. This ambiguity across the curriculum was defined as a barrier in Finland, however school curriculum that included concrete and practical interpretations of national curriculum helped teachers in their decision-making process to overcome this barrier. Additionally, strategic plans at the city and school levels apparently facilitated providing a mutual understanding and constitute a standard for implementations in Finland whereas the presence of a strategic plan, a vision or any curriculum at school and city level were reported in both S. Korean and Turkish cases. This may be the result of their centralized and top-down management systems.
- The flexibility of the curriculum allowed teachers to use the necessary tools or methods in line with their and students' needs. This flexibility, however, also left room for teachers to not use any tools or technology at all. The lack of an enforced necessity appeared to lead S. Korean teachers to decide to never incorporate technology in the classroom in some cases. This behavior can be defined as an abuse of autonomy example.

- Although there was a requirement for technology use in S. Korean curriculum, the teachers ignored it. Because, it was thought that the long-term emphasis on the use of technology in education has reached its goal already. Nevertheless, the enforced approaches that didn't match with teachers' beliefs, attitudes or competencies regarding the use of technology in education were criticized due to its being not fully acceptable by the teachers. In Turkish case, this kind of situation may also be an issue in the implementation of FATIH project. While it is much likely to be encountered with such a problem in Turkey and S. Korea, this kind of issues may be resolved by ensuring the active participation of all affected and role taking parties to the process of policy making. Therefore, all the parties may adopt a more positive approach during the implementation process of these commonly determined policies in this way.
- In Turkey, teaching intensive content in the curriculum within a limited time was an obstacle against creating time to have activities that required the use of technology in the classroom. The focus on the content interpreted as a fact that encourages teacher-centered education.
- In S. Korea, teachers' excessive workload seem to eliminate the time and energy for the teachers to prepare a lesson that will promote students to use technology more and interact with related course materials.

5.1.1.1.2. Financial Issues and Their Possible Solutions

Inadequate Budget Allocation

As forecasted, the current study indicated that the implementation of current policies regarding the ICT integration in education was limited to economic boundaries of each county in addition to their policy implementation approach. In one way or another, there was insufficient financial support for education in each country according to the participants. In Finland, there was insufficient budget for technology purchase and payments regarding the substitute teachers, which kept regular teachers from participating in professional development courses and events. Unlike Finnish government, S. Korean and Turkish government had a big investment in advanced technologies in scope of government-funded projects with large budgets such as Smart Education, Cyber Learning Systems and FATIH project.

The results of this study did also show that the budgets allocated by the government to the schools and the way that the school administration managed this budget brought financial constraints on the process of technology integration in each case. Even if financial limitations were a common issue, they produced different outcomes in each case. The differences amongst the cases emerged in the solutions brought to overcome the problems. Only Finnish participants addressed an extensive number of solutions to the issues regarding the limited accessibility to technology due to limited budget allocation.

In Finland the training schools had bigger budgets than local schools. They were acting like subsidiaries to universities and were responsible for training the pre-service teachers. Owing to given importance to teacher education in Finland, the training schools had more support and investment than other schools. Considering that the concept of equality in Finland is one of the fundamental components of society and education system (Pollari et al., 2018), this inequality was described as the availability of more technologies and therefore more practice opportunities. Some participants suggested that this problem could be solved with the help of a good leadership. Additionally, technology procurement through projects, using shared technology provided by the city board, leasing the devices, the adoption of Bring Your Own Device (BYOD) concept, inviting the educator to the school instead of going to another city for the ICT course were the alternative solutions developed to overcome financial inadequacy.

On the other hand, this inequality was linked to deficiencies in schools' physical infrastructure in Turkey. The majority of Turkish schools in the study were constrained from acquiring new technology as their allocated budgets were largely taken up with maintaining basic requirements with priority. An anomaly in these Turkish schools would be those associated with the FATIH project as they receive additional support regarding the provision of technology differently from schools not involved in this project. If a school was not within the scope of FATIH project, this school would not have an allocated budget for technology purchase or upgrade. This situation was defined as the inequality of opportunity in education according to Kurt et al.'s (2013) study findings. The number of schools within the scope of the FATIH project was not very much and not every school was included to the project in the same region. Although this problem was attempted to be overcome by the donations received from the parents through parents-school associations (PSA), but the socio-economic situation of the surrounding in which the schools were located may not always allow it. FATIH project may have the purpose of providing equality of opportunity in education, in practice, it can be observed that it brought inequality for the schools that are not involved in this project.

The inadequacy of school conditions or opportunities was not mentioned in S. Korea. Even if a huge gap was observed between private schools and public schools regarding their technology infrastructure, this finding was excluded from the study since it remained out of study scope. However, it is still interesting to note that classes in S. Korean schools in the current study had almost the same equipment- nothing more than a desktop computer, a flat TV and a projector. These findings are consistent with those of Shin (2015) who found that there is a small number of computers for student to use in a typical classroom in S. Korea. Thus, he concluded that although South S. Korea is one of the most technologically advanced countries in the world, more investment is required for the technological infrastructure in schools. Interestingly, our findings did also indicate that there was no financial problem in purchasing technology initially. Because, the problem was not purchasing the necessary devices but the budget was short for renewing and updating existing devices in long term even though there was a budget allocated only for ICT- related purchases at the school level. In S. Korea and Turkey, the findings didn't suggest an existence of alternative solutions to prominent financial issues. The budget was mostly spent on the priorities of the school decided by the management.

In Turkey, in the process of technology integration in education, investments were generally made to purchase equipment. For example, the FATIH project can be described as a tecno-centric policy (Kozma, 2008). In the study of Yolcu and Bayram (2016), findings were obtained indicating that the FATIH project couldn't go beyond than being a system that centralized the use of interactive boards and tablets along with the fiber optic internet technology. Those findings also stated that with this form of technology use, it rendered to be a gaming environment for the children rather than a contribution to their education. Additionally, Çetin and Solmaz (2017) argues that Turkey, especially focuses on quantitative data such as the number of devices or number of teachers that received in-service training instead of qualitative data such as the effectiveness and quality of training activities. They review the insufficiency of the available research and feedback provided by the government regarding how the trainings given to the teachers and distributed technological devices affect the education process. For example, during the FATIH project, it was decided to stop the distribution of the tablet computers to the children although they were already purchased. Then it was declared that the students will be supplied with desktop computers instead. This situation indicates that some of the budget was wasted and the financial plans were harmed. It can be also inferred that rather than the size of the allocated budget, how it is spent matters the most.

In some of the projects in S. Korea, conducted regarding ICT integration to education, a techno-centric policy is observed just like in Turkey's FATIH Project. For example, in addition to tablet computer distribution to elementary and secondary school students as part of Smart Education Project up to 2015, it was aimed to develop z-books like e-textbooks that could be used on the tablets to replace the printed books. These projects in S. Korea and Turkey also differ in terms of teachers trainings objectives too. Along with the development of the e-learning industry in S. Korea with the government support since 2004, Smart Education Project has been implemented between years 2011-2015 to make e-learning more common in education field. (Kim, Cho & Lee, 2013). In short, Turkey and S. Korea have launched large-scale, government-supported ICT use projects, while Finland hasn't. Finland seems like featuring the participation in the studies based on research and collaboration more. For example, "Systemic Learning Solutions (SysTech)", which is a large scale project aiming to develop technological learning solutions and to make it a part of Finland's education system, has been implemented since 2011 with the cooperation of Hong Kong, Singapore, Spain, and the United Arab Emirates besides Finland and S. Korea at the second phase (Kankaanranta & Mäkelä, 2014). This project seeks to constitute and generalize effective teaching methods, innovative ICT concepts and procedures in order to develop 21st century skills with the cooperation among researchers, companies and educational institutions. Among the participant countries, distinct differences are marked regarding the objectives, conducted projects, implementation methods and philosophies.

Summary of this Section

- Economic boundaries of each country had a role in their implementation of current policies regarding the ICT integration in education. Insufficient financial support for education in each country was reported. For Finland, this inefficiency hampered the purchase of technology and sustaining substitute teachers. Inability to allocate budgets to finance the substitute teachers made it difficult for the teachers to participate in professional development activities outside of school. Unlike Finland, the governments invested in large-scale nation-wide projects to support technology integration in education in S. Korea and Turkey.
- In Finland, the different amount of budgets given to local and training schools created an inequality in terms of available technologies and the opportunities they provided for the students. There was a belief that this problem could be

solved with a strong leadership. In addition, technology procurement through projects, using shared technology provided by the city board, leasing the devices, the adoption of Bring Your Own Device (BYOD) concept, inviting the educators to the school instead of going to another city for the ICT course were the solutions applied to overcome the issues caused by financial limits.

- The type and amount of technology available in schools and the budget allocated for maintenance and teachers' training varied depending on whether the school was within the scope of FATIH project or not in Turkey. This was defined as inequality of opportunity in education, which was the exact opposite of the purpose of project. The interesting point was that the schools that were not within the scope of the project had no budget left for technology related improvement, because the budget was spent on maintenance requirements of the school building. The reasons for the emergence of the budget issue for technology integration was associated with autonomy and responsibility given to the school administration.
- Although S. Korea is one of the world's leading countries in advanced technologies, the public schools visited surprisingly had a basic and standard level of technology infrastructure. It was still necessary to make an investment for infrastructure improvement. Renewing and updating existing devices in long term were defined as a shortcoming even though there was an allocated budget only for ICT-related needs of the school. Similar to Turkey, in S. Korean schools, the budget was spent according to the primary needs of the school decided by the management.
- In S. Korea and Turkey, techno-centric policies which constitute high expectations as educational output were determined. For Turkey, such a project has meant the increase of technology and materials numerically, rather than the effort to increase the quality of education. There could be problems in planning and management of the projects and budgets. On the contrary, in Finland, large scale projects that involved more participation in research and collaborative studies were prioritized.

5.1.1.1.3. Infrastructure, Maintenance and Support

Access to Technology

The current study found that each country had issues related to infrastructure. In Finland and S. Korea, there were not a major issue regarding the technology or internet access, but the lack of a regular infrastructure update was seen as a down side of their system. In the case of S. Korea, this finding is in agreement with Kim and Lee's (2011) findings which showed that students and teachers rated the level of infrastructure and communication technology available high enough in terms of utilization opportunities presented to individuals. On the other hand, in particular, the insufficient number of equipment was considered as an issue in Finland. In Finland and S. Korea, technology could be reached when required even if the number of the devices were insufficient or devices were old-dated. In Finland, even when there was only one tablet PC or computer available for the use of teachers in some cases, they showed an exemplary behavior by making that one device useful as much as possible. In other words, to end up with a meaningful technology use was not entirely correlated to only having extrinsic enablers available (Ertmer et al., 2007) in Finnish case. As Ertmer et al. (2007) discussed, due to strong beliefs, personal visions, and commitment they possess, some teachers are able to accomplish an effective use of technology even when there is a limitation of resources and time, which sets an example for the others. Finnish participants were like the teachers showing model behavior.

In Turkey, unstable internet, the lack of updated equipment and maintenance were the issues arose from implementation of FATIH project. One unanticipated finding was that FATIH project would halt or deteriorate technology integration in the schools that were not within the scope of project, even if FATIH project was a movement that aimed to increase opportunities and to improve technology integration. Already existing technologies were either not upgraded or even removed from 'other schools' due to the expectation of upcoming projects. This finding is in accordance with the findings of Tarman et al.'s (2015) that suggested the possibility of the emergence of inequality due to incomplete technology integration into education.

In Turkey, unplanned infrastructure establishment and impractical placement of equipment in the class were also considered as infrastructure related problems. The findings didn't reveal any similar problem in other participant countries. These infrastructural and planning problems can be explained by the inability to be effective and standard in implementation and supervision of the projects since there are long and short-term plans, and action plans for their implementation. Some studies showed that Turkish MoE wasn't able to successfully manage the process of well-planned projects prior to the FATIH project (Özdemir & Kılıç, 2007; Uluyol, 2013). Although the project is well planned on the paper, it may fail due to implementation and management issues. FATIH project was criticized for its shortcomings in terms of design and unclear output definitions (Ekici & Yılmaz, 2013; Uluyol, 2013). Therefore, the researchers concluded that the current form of the project can not be integrated into the education system and failure should be expected. It was obvious that the planning, implementation and evaluation phases of the project should be reviewed closely. There were justified reasons for the suspension of the FATIH project unless the necessary changes were made. It was obvious that providing only an infrastructure and expanding it did not fully meet the requirements in order to increase the level of informatization (Kim & Lee, 2011).

Technical Problems

The results of the present study showed that in Finland and Turkey, slow and unstable Wi-Fi and incompatibility of the operating systems on different devices were among the technical problems that hindered technology integration. In S. Korea, the findings did not reveal a mutual problem claimed by many participants. There were some concerns about security of online platforms and ethical use of technology though.

It is somewhat surprising that while high speed stable Wi-Fi was desired for the use of online tools effectively in Finland, it was demanded in Turkey to be able to watch videos or download documents in short time. It is also critical to note that in Turkey, the restrictions on the internet enforced by MoE was another issue that made the ICT use of teachers and students difficult. This finding is in agreement with Altın and Kalelioğlu's (2015) findings which showed that internet restrictions on interactive boards and tablet PCs reduced the students' motivation to use those devices.

In S. Korea, there were security concerns, but they still did not restrict the internet access. Instead, MEST established The Education Cyber Security Centre in 2006 (Hwang, Yang & Kim, 2010). It was made available to the use of institutions in order to ensure a secure internet environment, to enable the use of education information services, and provide protection against external hacking attempts. Besides, many awareness projects were developed and implemented at private and public sectors. Some participants also suggested that the use of applications designed for educational purposes such as Classting could produce solutions to this situation. Teaching the ethical and safe use of technology was valued in S. Korea rather than establishing restrictions, and in Finland, teaching self-regulation to students was prominent.

Maintenance & Support

Another important finding was that there were differences in the ways of providing maintenance and support regarding the existing technology for the users. Finnish and S. Korean education system included a variety of service provider from both private and public sectors, while Turkish technology maintenance and support did depend on IT teachers, schools' budget, and if FATIH project was available in the school, the providers of project components within the warranty period. Establishment of a maintenance and support system similar to the ones in S. Korea and Finland could also be suggested for Turkey. It is understood also from the study of Kurt et al. (2013), that this kind of improvement is required. Furthermore, the participants are mostly in favor of a practice such that the technical problems developed within the scope of FATIH project are solved through technical support staff available locally instead of through a single main center.

Different than S. Korea and Turkey, Finnish schools leased their devices, provided necessary devices, maintenance and support through the projects and got help from city board and university technical centers. In this way they could have up-to-date machines when required. Because the leasing was renewed every 5 years, so were the machines. In S. Korea, the schools had professional technical staff who maintained facilities and equipment. In all cases, they would get help from an outsourced contractor as well. Maintenance and support practices in Turkey show differences when compared to leasing system in Finland and service provision from professional technical staff in S. Korea.

Summary of this Section

- In schools of S. Korea and Finland, there were not a major problem with access to the internet or technology, but there were problems regarding the update of available technologies.
- In Finland, there was a shortcoming related to the number of technologies provided due to financial limitations, but these were tried to be solved by sharing available technologies in schools and regions, finding resources with the help of some projects.
- On the contrary, Turkey still had fundamental problems with technology access in the schools that were not a participant of the FATIH project and the schools within the scope of mentioned project faced issues regarding internet access since it was mostly slow running, unstable and censored to some extent. Internet restrictions on interactive boards and tablet PCs were considered as a barrier against students' and teachers' technology use.
- The problem of unstable and slow running internet was also present in Finland. While Finnish teachers wanted fast and stable internet to use online tools more

effectively, Turkish teachers wanted it in order to be able to watch videos and download files faster only.

- Noncompatibility of the operating systems on different devices was another technical problem mentioned by Finnish and Turkish participants.
- Concerns about security of online platforms and ethical use of technology were only reported by S. Korean participants. Awareness-raising trainings and studies in the private and government sectors had been conducted for many years in S. Korea. In order to provide security and protection in internet use eliminating sinister attacks and enabling the proper use of education information services, required institutions and organizations were constituted.
- Rather than introducing restrictions, it was aimed to teach the ethical use of technology and emphasizing safety in S. Korea. Finland was aiming to teach self-control to students prominently.
- Unlike the other cases, unplanned infrastructure establishment and impractical placement of equipment were other infrastructure related problems in Turkey. The inability to be effective and establishing a standard in implementation and supervision of the projects at any managerial position seemed to be the source of the problems in despite of the existence of long and short term implementation plans.
- Each country provided different maintenance and support services, but getting help from an outsourced contractor was the mutual practice among them. While, the schools in Finland and S. Korea were receiving assistance from various private sector and state related service providers, Turkish schools could receive help depending on the availability of the IT teachers, the school budget, or the terms of the warranty provided by the outsourced contractor companies.
- In Finnish case, leasing the devices enabled the technology to remain up-to-date, since devices were renewed every 5 years while renewing the contract. Other way of providing necessary devices, maintenance and support was

through the projects and getting help from city board and university technical centers for Finland.

- In S. Korea, the schools had professional technical staff who maintained facilities and equipment running okay.

5.1.1.2. RQ1b. At meso level

5.1.1.2.1. Leadership and Management

The current study showed that a strong leadership of administrators would play a key role in the full realization of ICT use in schools in each case. In accordance with the present results, previous studies have demonstrated that leadership plays a critical role in the effective use of technology for instructional purposes (Yuen et al., 2003; Niemi, Kynäslahti & Vahtivuori-Hänninen, 2013; Gök & Yıldırım; 2015). As reported by Niemi et al. (2013), the evidence found that the provision of resources to buy technology and the decision of purchasing technology at the schools remained greatly dependent on school principals' approach even though their role and their attitude varied amongst the countries in our study. Priority in resource allocation to enhance ICT use was found as one of the eight school leadership constructs that were identified by Yuen, Lee and Law (2009). Additionally, the findings revealed that the technology orientation of the teachers was changing according to whether the use of technology was the priority of the principals or not in each case. The findings of the current study are consistent with those of Yuen et al. (2003) who investigated the leadership issues in ICT implementation in a case study involving 18 Hong Kong schools. Their study indicated that ICT use in teaching and learning is strongly dependent on the school leaders' vision and understanding of the role and impact of ICT in education.

In Finland, the findings revealed that the school principals were responsible for finding the resources to support ICT use through involving in or submitting to a project. Making the decisions regarding the purchases were not depending on only the principals but also the discussions among principals, teachers and city board. In S. Korea, the schools had a budget allocated only for ICT- related purchases, but this budget was not found enough for a good technology integration in the classrooms. Because, this budget was not sufficient for updating existing technologies.

In Turkey, there were two different roles of school principals emerged depending on whether or not the FATIH project was implemented at the schools. If a school was within the scope of the project, the role of administrators was keeping the equipment and systems available and running efficiently since they already have the devices. Keeping the existing technologies running smoothly was more important than increasing their number in these schools. But, in other schools, their role was considered as providing access to the technology that was currently available at school. Curiously, that was because the computer labs would be kept locked or wouldn’t be open for the classes of other subject matter teachers in order to prevent any damage to equipment. Although it was not mentioned by many, it is crucial to note that some principals in Turkey were able to consider setting a budget for their own technology needs first rather than the needs of the school itself. In this context, the implementation of the FATIH project independent from school policies and management enabled technology integration by supporting access to technology.

In each three cases, the administrators were seen as being supportive of teachers’ technology use. But their being encouraging were suggested in only S. Korean and Finnish cases. In Finland, the administrators would be encouraging and supportive to the extent allowed by the budget. The findings of the current study are consistent with those of Niemi et al. (2013) who described the principals’ leadership role as to provide teachers with encouragement and support regarding ICT use and development, and they are also expected to ensure that required resources, facilities and infrastructure are supplied.

Finnish and S. Korean school principals found open to the new ideas submitted by the teachers related to ICT use. Interestingly, in S. Korea, encouragement would be possible by rewarding desired behaviors in teachers. Surprisingly, in S. Korea and Turkey, the findings indicated that the principals wouldn’t take any action to encourage and promote technology use unless the teachers demanded anything from the principals. Teachers' requests and efforts would put the principals into action.

In Turkey, at a school where FATIH project was implemented, the principals found themselves responsible of being supportive. Otherwise, in other schools, if the technology integration was not prioritized, the principals wouldn't be that much supportive. Although very few people have stated, the inspectors' wish to see technology use in the classroom could push some principals to become more supportive of technology use in the schools where FATIH project was implemented. Although our findings give hints that the principals act supportive, in the study of Yolcu and Bayram (2016), it was revealed that the FATIH Project was exploited as a tool of pressure and inspection upon teachers by the management. In Turkey and S. Korea, it is observed that the external motivations (Ertmer, 2005) shape the behaviors of the leaders, which is also valid case for the teachers.

In the cases included in current study, the principals had different priorities and leadership competencies. In Turkey and S. Korea, favored school leadership competencies such as being visionary and acting strategic were to be improved. For school leaders to have these competencies proved to be crucial for teachers' pedagogical orientation to achieve effective integration of educational technologies (Yuen et al., 2009). The findings of Hacıfazlıoğlu, Karadeniz and Dalgıç's (2010) study identified three main obstacles that prevented school administrators from being a visionary leader in Turkey: (1) A centralized education policy, (2) lack of ICT knowledge and required competencies, and (3) older, experienced teachers not being open to innovation. The first obstacle centralized Turkish education system and its influence on the technology integration was discussed at the macro level. Participation of actors in the process of technology integration, as in the case of Finland, may enable Turkey to overcome this barrier. In order to be a participant rather than just a follower of the system, school administrators should be given the authority to use initiative to some extent as well as responsibilities. YEGITEK may put emphasis on the role of the school administrators as visionary leaders in order to promote efficient and effective use of ICTs (Gök & Yıldırım, 2015). Second obstacle can be removed by providing trainings also for the administrators to develop their ICT skills and leadership competencies. In this study, only one Turkish principal stated that he had attended technology leadership course because he was obliged to do so as a requirement of FATIH project. As the third obstacle, the tendency of the elderly teachers to avoid innovations and technology use was indicated and these teachers could limit the actions of visionary managers. The reason for that can be stated as the high expectations of the school management from the teachers and the management's perception of technology leadership, which may be regarded as a reason for unsatisfaction by both the teachers and the management (Hacıfazlıoğlu et al. 2010). A shared vision that is commonly determined and the development of an operational policy at the school level can help to overcome the third obstacle.

Consultative and Distributed Leadership

In each three cases, the administrators found not to put an apparent pressure on the teachers to use technology in the classroom. Teachers would decide whether or not to use technology on their own. The provision of this permissive environment was carried out in different ways and for different reasons across the countries. In Finland, a consultative leadership style found to eliminate any pressure coming from administrators. As a result of this leadership style, making joint-decisions as a community eased the implementations of policies during the period of technology integration in Finland. This democratic and collaborative understanding would not be formed only as a requirement of the introduction of technology into education. It is also a reflection of Finland's social and cultural context (Moos, Möller & Johansson, 2004). Although, the responsibility for making the final decision always stays with the school principal, the leadership roles are distributed among various teams at the school. According to the report "Innovative Schools, Teacher and Learning in the Digital Era" published in 2015 by The European Parliament, distribution of the leadership aimed to reduce the responsibility load and the number of administrative tasks that come with technology integration in order to allocate the necessary time for pedagogical development work regarding technology integration (Lonka et al., 2015).

Taipale (2012) explained that the teams consist of teachers who were temporarily assigned among teachers, since there is no hierarchical structure among them. In Finland, the design of schools showed that the hierarchical structure of the school community was not clearly set. As observed on school visits made, in a different way from S. Korea and Turkey, the principal's room was taking place just next to the teachers' room and there existed a transition via a door placed in between these two rooms in Finland. The managers were always available and acted as a part of the community. However, as it was seen by the observations at the schools in S. Korea and Turkey, principal's room had always been designed as a section that is more remote from the teacher's room and kept private. The symbols of the hierarchy could still be observed in the design of the schools in S. Korea and Turkey.

Although it was thought that the hierarchical structure might cause a pressure enforcing teachers to use ICT, interestingly it was not the case in Turkey and S. Korea. Unlike Finnish case, the reason for a pressure free environment was not due to having a consultative leadership in S. Korea and Turkey. In fact, In S. Korea, our findings indicated that the teachers and students were already able to use technology at a certain level since technology use was a part of their daily life. Thus, there was not much motive stimulating the use of technology so often and so much anymore. Since S. Korea had been trying to integrate technology in education with policies developed since 2001, teachers have been using technology in class activities for some time. Therefore, new policies or policies in operation did not increase or change teachers' use of ICT in the classroom (Shin et al., 2014). In our study, the reason for teachers to constantly emphasize that the teachers and students are able to use the technology sufficiently may be because they are constantly in the environment where technology is available. However, the relevant finding does not give any clue about the efficient and frequent use of technology in education in S. Korea. There was no pressure but the guidance was not also effectively provided in S. Korea, according to the participants.

It is somewhat surprising that the participants in Turkey were in opinion of that the administrators did not give much importance to technology integration. Therefore, there were not any pressure or push to enforce the technology use in education processes in Turkish case. It was up to the teachers whether to use or not. For this reason, there were participants who said that there should be some pressure to some extent regarding the use of technology. When findings regarding the leadership's aspects shown in the participant countries in our study are compared, it can be said that the failure or rise of an organization is rooted in the leadership.

Summary of this Section

- A strong leadership of administrators may play a key role in the full realization of ICT use in schools in each case, because given priority in resource allocation to enhance ICT remained greatly dependent on school principals' approach. The importance given to the use of technology by school administrators could also have an impact on teachers' approach to technology.
- In Finnish case, leadership was important but its importance was sourced in the discussions among principals, teachers and city board for the decisions to be made regarding the purchases. The principal was primarily responsible for finding the resources to support ICT use by involving in or submitting to a project.
- In S. Korean case, big scale projects and allocated budgets for ICT integration were available. Their management and implementations at school level were the responsibility of the administrators.
- In all three cases, the administrators were supportive of teachers' use of technology to the extent allowed by the budget, but only in Finland and S.

Korea administration encouraged the educators to use technology. The use of technology in S. Korea was encouraged by rewarding this behavior. Only in S. Korea and Turkey, the administrators were not excited about taking action if there was no demand coming from the teacher for the implementation of new ideas regarding the technology integration.

- In Turkish case, in the schools within the scope of the project, the responsibility of the administrators was to keep the existing technologies in a working condition, while in the schools that were not included to the scope of the project, the responsibility of the administration was basically to provide access to the technologies if they existed. In some schools, managers could purchase technology in line with their own needs or access to existing technologies could be prevented in order not to harm them while using. These were the characteristics that were not related to an effective leadership qualifications. In this context, the progress of FATIH project being independent of administrators can be seen as an advantage for technology integration. The existence of the project pushed the principals to be supportive. In schools excluded from the project, if technology integration was not a priority, the administrations wouldn't be as supportive.
- In Turkey, the school administrators may feel responsible for the use of technology in education because of the inspections to be carried out at school. Therefore, the FATIH Project could be used by the administration as means of pressure upon teachers due to expected inspections by the government regarding the proper implementation of the project at schools. In Turkey and S. Korea, it was revealed that external motivations shaped the behavior of leaders, and this was also a valid case for the teachers.
- The principals observed and evaluated in the context of this study, had different priorities and leadership competencies. In Turkey and S. Korea, school leadership competencies such as being visionary and acting strategic seem to remain relatively weak. The possible reasons for this were interpreted

as a centralized education policy, lack of ICT knowledge and required competencies, and elderly teachers not being open to change and innovation.

- In Finland, a consultative leadership style was the source of the provision of a permissive environment where teachers could decide the ways of using technology by their own will. Making joint-decisions as a community facilitated the implementations of policies during the period of technology integration. Although, the school principals were always the ones to make the final decision, different members of the school community also took responsibility in terms of leadership to a great extent. Because of this democratic and collaborative understanding in Finland, the hierarchical position of the principal was not clearly set within the community as it was in S. Korea and Turkey.
- In S. Korea, even though it could be guessed that the obvious hierarchical structure might put pressure on teachers to use technology, this was not the case. An evidence of consultative leadership style was not observed or detected either. A pressure free environment appear to be originated from the idea of that the teachers and students were already capable of technology use at a certain level since technology use had been a part of their daily life for a long time. But this situation didn't ensure an efficiency and high frequency of technology use in education in S. Korea. Since the technology was available in almost all fields of life in S. Korea, this might be the reason for teachers to constantly mention the students' capability of technology use.
- In Turkey, the participants were skeptical about given importance to technology use in education by the administrators. It was mostly stated that the administration did not give enough importance and the reason for that was explained as the absence of an enforcement or encouragement for the teachers.

5.1.1.2.2. Community Capacity Building

In each case, the findings suggested that building capacity of the school community for effective technology integration process was the responsibility of the principals as the key component of the school community. In this study, 3 forces appeared to develop the community capacity: Shared vision, shared ICT leadership and enabling professional learning. However, these forces were not available in each country.

Finland was far ahead of others in terms of carrying and implementing these forces. This may be because the Finnish schools have the fundamental features of the leadership that enables community capacity building. These features are also defined by Lavonen (2017) as the requirements for a successful decentralized governance in Finland. Goal orientation, comprehensive collaboration and explicit structures in administration are the essential elements of leadership in Finnish schools. Our findings further support the leadership concept of Lavonen's (2017).

Shared Vision

The concept of a shared vision that contributed to community capacity building did not occur in all cases in this study. As predicted, the evidences showed that while Finland possessed the necessary preconditions, works, support and collective understanding for the creation of a shared vision, other countries could not go beyond having a vision at the individual level. Strikingly, the Centre for International Mobility (CIMO) agency under the MoEC explains that their strategic goal is to make Finland a leading country of knowledge, participation and creativity by 2020 (CIMO, 2011). In order to achieve this, they emphasize the ability to keep an open mind as one of the key factor. Additionally, they point out that realizing long-term trends and willingness to continue development can help achieve greater social change and overcome global challenges. In Finland, educational infrastructure, and teaching and learning methods are taking their share from this strategic plan and understanding.

Strategic plans in Finland were not only at the national level, but also at the city and school level. The city strategy was set by a city association, the school strategy plan was built by a group of teachers and the principals. They appeared to help creating a mutual understanding of what teachers would do in practice under the leadership of principals. This is in line with Kozma's (2008) idea that national strategies can guide the formulation of operational policies at the local level in order to create a vision.

In the current study, the findings also suggested that a cooperating community (joint-decision making, group discussions, and distributed leadership) and a strong school governance were the most prominent concepts that helped to share the responsibilities and create awareness amongst all partners in the process of technology integration in Finland. This finding is in agreement with the definitions of leadership and community characteristics of Lavonen (2017). Correspondingly, Niemi et al. (2013) found that it is possible for the teachers to set joint goals and even teach together when the management has a certain vision and supports the cooperation at schools. These are practices in the field of education that serve the ultimate purpose of becoming a leading country in terms of knowledge and participation.

On the other hand, other countries didn't have tangible visions adopted or a good strategy employed. In S. Korea, our findings showed that ICT-related visions and ideas were limited at the individual level and linked to the personality of the principals. But, in Turkey, there was a shared vision regarding technology use that formed around FATIH project. However, the priorities identified by the principals prevent the creation of a shared vision anyway. When comparisons are made amongst cases based on observed leadership characteristics in current study, this finding is in agreement with Yuen et al.'s (2003) findings which showed the leadership role adopted in schools was shaping the way in which integration would be implemented. Of course, the emergence of different technology integration practices reflects the different educational values and emphasis rooted in the history and culture of the schools offered. However, as the findings of Yuen et al.'s (2003) study showed that the role of schools' objectives, their perception of ICT's role in education as well as their understanding of teaching and learning cannot be neglected in the emergence of different practices in the process of technology integration.

Shared ICT Leadership

In Finland, the findings clearly suggested that the practices of shared ICT leadership which was grounded around a shared vision was more distinct, and observed more commonly than other two countries. Individuals from different levels of education system with different job descriptions were involved in the process of technology integration. An ICT coordinator at the city level, a principal, an ICT advisor, an ICT group consisting of a few teachers and advisors assigned by the principal at school level and the university academicians would share the responsibilities of providing guidance for the teachers. If leadership is a factor determining the success of implementation of ICT integration (Yuen et. al, 2003), the development of other leaders and the acceptance of the relationship between community members can ensure the success of integration as a whole.

While the practice of shared ICT leadership was quite tangible in Finland, there was not much evidence explicitly suggested a concept of shared ICT leadership in S. Korea and Turkey. In Turkey, 2 main reasons were disclosed that may hinder the formation of a shared ICT leadership: (1) dominance of an authoritarian leadership style, and (2) existence of a common perspective that doesn't value technology integration very much within the community. Firstly, the findings showed that a more authoritarian leadership style was still dominant. A centralized educational structure didn't catalyze the formation of a collaborative environment where decisions were taken together. Because, the school culture was determined by the school management's point of view itself. Likewise, findings here support the findings of Hacıfazlıoğlu (2010) stating that a central education system poses a barrier against the phenomenon of being a visionary leader, as discussed under the title "Leadership and Management". In this context, the implementation of the FATIH project independently from school management was seen as an advantage. The principals could not restrict access to technology based on their personal viewpoints.

Secondly, not only the administration but also other teachers, students, and parents did not perceive computer lesson as one of the important lessons, according to the participants in Turkey. Thus, a shared ICT leadership would not even a matter of discussion. The community did not possess a heightened awareness regarding the significance of technology use in education. It was crucial to gain awareness about the necessity of technology integration. The reason for not being able to generate the concept of a shared vision and leadership may be due to the ICT policies which did not take teachers' beliefs, attitudes, and values into consideration in Turkey. If ICT policies could reflect these characteristics, technology integration in schools is likely to be successful (Tondeur et al., 2008). Finland identifies shared goals with participation. This is an attempt to prevent teachers' resistance to change through providing sense of ownership of the goals. This path that Finland follows can set an example for S. Korea and Turkey to pave the way for a better and maybe an advanced ICT integration policy and an improved practice accordingly.

Professional Learning Opportunities

Enabling professional development learning opportunities was seen as one of the responsibilities of the administrators in Finland. The Finnish administrators would support, encourage and sponsor the participation of teachers in the trainings which were jointly decided as necessary. But the findings indicated that in S. Korea and Turkey, it was not only the responsibility of the administrators, but also the responsibility of higher level institutions due to existence of centralized education system.

In S. Korea, the variety of courses including obligatory and elective ones that provided by MoE was found sufficient. Because, once again the participants pointed out that teachers did reach a certain level of ICT competency. However, if the teachers needed more opportunities, MoE and the administrators would be responsive to their requests.

On the other hand, even if the obligatory and elective trainings provided by MoE were available in Turkey, the teachers appeared to struggle to access them. There were 2 main reasons found to cause this problem in relation to administrators. First one was that the school administration did not approve the teachers' leave for the trainings because the school wouldn't able to provide a substitute teacher to fulfill the main teachers course schedule during his / her absence. Second reason was the late registration requests made for professional development courses by school management. Participants named this situation as unplanned training processes.

Summary of this Section

- In each case, it was essential to build the capacity of the school community for an effective technology integration process, and this was the responsibility of the principal as the leader of the community.
- Shared vision, shared ICT leadership and enabling professional learning were the forces that facilitated the development and improvement of the community capacity. Finland was the country in our study in which all three of these forces emerged. The reason is that the fundamental features of the leadership that would lead to the formation of these forces already exist in the Finnish schools. It is not surprising that these features were found in Finland, as these are the requirements of a successful decentralized administration.
- While there was a vision of a collective approach in Finland, an individual approach was predominant as the common vision in other two cases. The creation of a shared vision on ICT integration was supported by written documents namely strategic plans at national, city and school level. City and school level strategies were produced with the participation of their practitioners.

- Especially in the process of technology integration in Finland, a cooperating community and a strong school leadership were the most important concepts that facilitated the sharing of the responsibilities and creating awareness among all parties.
- On the contrary, an evidence related to a tangible vision adopted or a good strategy employed wasn't relieved in other two cases. In S. Korea and Turkey, ICT-related visions and ideas were limited to the individual level and linked to the personality of the principals.
- In Turkey, there was a superficial vision formed around the project. The priorities and needs determined by the principals would still prevent the formation of a shared vision.
- In Finland, shared ICT leadership practices based on a shared vision were more evident and observed more commonly than in the other two countries. Individuals from different levels of the education system with different job descriptions were included in the process of technology integration. They shared the responsibilities of providing guidance for the teachers.
- On the other hand, there was not much evidence explicitly suggested a concept of shared ICT leadership in S. Korea and Turkey. The reasons why a shared ICT leadership was not as observable as in Finland were presented as follows: Dominance of an authoritarian leadership style and the existence of a common perspective that doesn't value technology integration very much within the community were noted.
- For S. Korean and Turkish cases, the reason for not being able to generate the concept of a shared vision and leadership may be due to ICT policies which did not take teachers' beliefs, attitudes, and values into consideration. When decisions are not taken and goals are not set with the participation of the actors part taking in education, practitioners may not feel included in the process of decision making and goal setting. They may not embrace these decisions and

goals unsubtly. Therefore, teachers' resistance to change and government-imposed policies within school organizations can be expected.

- In order to improve the community capacity, enabling professional development and learning opportunities were one of the responsibilities of the administrators in Finland. While principals in Finland would take more responsibility on this issue because of shared leadership and management, in Turkey and S. Korea, higher level institutions due to the existence of a centralized education system would be more involved in the process of provision of the opportunities.
- S. Korean participants believed that learning opportunities were provided as required, and no issues or requests regarding the courses had been reported because they thought their ICT skills were already sufficient.
- Required opportunities were also considered as provided in Turkey, but teachers' inability to access these opportunities was detected. First of all, the administration was not approving teachers' leave when they wanted to attend trainings since they were not able to provide substitute teachers instead and they did not want the classes to be canceled. As the second point, the administration tended to miss the application periods for the trainings and therefore no participation in the trainings was achieved sometimes.

5.1.1.2.3. Collaboration & Cooperation

In the literature, the evidence shows that teachers' collaboration and cooperation provide advantages for teaching and teachers' learning (OECD, 2014a) as well as technology integration process (Yuen et al, 2003). It is of very high importance in terms of future to make schools a learning oriented institution, to contribute to the increasing significance of collaboration in society and to enable students get prepared for the future by setting an example for them through education (Vangrieken, Dochy, Raes & Kyndt, 2015).

As expected, the participatory involvement was a common practice in Finland. In countries that have an advanced education system such as Finland, teachers' collaboration level is high yielding great results (Vangrieken et al., 2015). Similarly, the findings offer overwhelming evidence for the existence of a stronger sense of community and culture of knowledge sharing in Finland than other two countries. As put forward by Niemi et al. (2013), the evidence we found points to a successful educational use of ICT requires a community-oriented approach. Remarkably, the findings showed that there were 5 distinguishing features of participatory involvement that facilitates knowledge creation and sharing within community members in Finland: The presence of an organizational learning concept, systematic formal knowledge sharing, informal practices for knowledge sharing, and sharing course materials online. Irrefutably, the existence of strategic plans, school-level curricula, and a shared vision along with knowledge sharing culture at a collective level would also foster community of practice.

In a sense, group meetings and discussion sessions at the schools, conferences and meetings for all teachers across Finland, the practice of the colleague based ICT tutoring (master/apprentice), creating projects that support a learning community within the city schools were found to support the emergence of the community of practice. The findings revealed that within these forms of knowledge flow, the acquisition of pedagogical practices of technology integration was usually carried out by informal knowledge exchange in Finland.

The findings suggested that switching classes or doing joint classes together was a unique and informal yet rare way of teachers' knowledge exchange in Finland. The common informal knowledge exchange practices were chatting in the coffee/tea breaks, a casual catch up or chat with ICT leaders, using social media, cloud technology and a game-based learning platform for collaboration. Interestingly, unlike other two countries, a casual interaction between teachers and students with the intention of knowledge and experience exchange would occur in Finland.

The existence of the concept of community of practice in S. Korea was not as strong as in Finland. Teacher communities such as smart learning community, department meetings, open-class observations, and the colleague based ICT tutoring did serve the construction of knowledge amongst S. Korean teachers. S. Koreans' unique practice was "open-class" activity that enabled sharing professional experience. Observing colleague's classes and providing feedback would help the flow of knowledge and experiences amongst the teachers. This practice may help the formation of a sharing and collegiality culture in the school (Munson, 1998; Quinlan & Åkerlind, 2000).

Similarly, in the TALIS 2008 and 2013 research, when S. Korean participants were asked about observing their colleagues' classes and providing feedback, each time this question asked, around three fourth of the participants reported that they did this activity at least once a year (OECD, 2014a). On the other hand, in the TALIS 2008 research, little more than one fourth of Turkish participants responded that they observed other colleagues and provided feedback, but most of the participants responded as "never". Correspondingly, in the current study, in Turkey, any kind of teachers' knowledge exchange activity was limited to regular group meetings. Since the members of the group included only same-subject matter teachers, the meetings weren't able to promote collaboration amongst other subject-matter teachers. The level of knowledge and material sharing were found to be at the minimum since these were not very common practices in Turkey.

Obviously, there is a difference between these two countries in practice of teachers' learning in collaboration. A possible explanation for this result perhaps underlies in the reason why S. Korea conducted more classroom observations. According to TALIS 2013 research, these activities were largely done to fulfil administrative requirements in S. Korea (OECD, 2014a). However, this was done as a government-imposed policy in S. Korea, the impact of it was questionable. Since there was not such a requirement featured in Turkey, teachers perhaps did not feel the need to do so.

Besides, teachers consider their lessons as they are also something private to themselves only (Aslan, 2015).

Although, the results of this study indicated the presence of community of practice in S. Korea, there was also evidence pointing the absence of the collaboration and knowledge exchange amongst S. Korean teachers. Personality traits of teachers valuing privacy, heavy workload and teachers' fear of failure or intimidation while they were observed were proposed as the reasons for lack of the required level of collaboration and knowledge exchange in this study. In the literature, non-judgmental and constructive feedback (Lomas & Nicholls, 2005), and trust (Donnelly, 2007) amongst teachers are defined as key elements of a successful peer observation system. School environment in S. Korea seemed to lack of these elements.

Additionally, in S. Korea, the teachers appeared to be more in favor of privacy and they were self-taught individuals mostly. S. Korean teachers were more likely to do their learning and teaching practices individually rather than collaborating. Online platforms were preferred to use on the purpose of knowledge exchange rather than face to face meetings. It may be because the professional development trainings are mostly provided online and regarded as of high quality in S. Korea (Latchem & Jung, 2010). The practices of formal knowledge exchange didn't happen often due to their intensive course schedule and additional school-related tasks. On the other hand, another finding worth mentioning is that according to Finnish participants, successful technology integration required teachers to shift from individual work culture to collaborative one. But, the findings showed that this was not the case in S. Korea and Turkey.

It was interesting to note that since there was usually one computer teacher in each school in Turkey, the sharing of knowledge among computer teachers was simply out of question in the visited schools. The computer teachers would benefit from online platforms for the knowledge exchange. The interaction between other teachers and computer teacher was not going beyond casual consulting issues.

Summary of this Section

- The participatory involvement was a common practice in Finland. The existence of a stronger sense of community and culture of knowledge sharing was detected in Finland. The existence of a concept regarding a community of practice in S. Korea was not as strong as in Finland.
- The presence of an organizational learning concept, systematic formal knowledge sharing, informal practices for knowledge sharing, and sharing course materials online facilitated the knowledge acquisition and an approach of sharing within the community members in Finland. Strategic plans, school-level curricula, and a shared vision along with a knowledge sharing culture at the collective level would promote community of practice.
- Group meetings and discussion sessions at the schools, conferences and meetings for all teachers across Finland, the practice of the colleague based ICT tutoring, creating projects that support a learning community within the city schools supported the emergence of the community of practice in Finland.
- Informal knowledge exchange practices including chatting in the coffee/tea breaks, a casual catch up or chat with ICT leaders, using social media, interacting with cloud technology and the existence of a game-based learning platform for collaboration appeared to support the establishment of pedagogical practices regarding the technology integration in Finland. In addition, switching classes or doing joint classes together was a unique practice that promoted teachers' knowledge exchange as well. This knowledge exchange was not only between teachers but also between students and teachers. A featured practice for sharing professional experience was "open-class" activities observed in S. Korea. Along with open-class activities, teacher communities, department meetings, and the colleague based ICT tutoring supported the construction and exchange of the knowledge among S. Korean teachers.

- In Turkey, the exchange of knowledge amongst teachers frequently took place through regular group meetings. However, the meetings did not foster collaboration among all different kinds of subject-matter teachers, because the members of the group consisted of teachers only from the same subject. Since there was only one computer teacher in each school, they were not involved in group meetings. They would casually consult with other teachers.
- The occurrence of different practices in S. Korea and Turkey may be because the open-class activity was an administrative requirement in S. Korea.
- In S. Korea and Turkey, the presence of the collaboration and knowledge exchange amongst teachers were almost absent when it was compared to Finnish case. Personality traits of teachers could be the barrier to against the establishment of an interactive collaboration among teachers. S. Korean teachers were more in favor of privacy and they were mostly self-taught individuals. Thus, they preferred to learn individually from online professional development courses and to exchange knowledge through online platforms. Intensive course schedule and additional school-related tasks seemed to hinder collaborative work both in S. Korea and Turkey.
- The transition from an individual work culture to a collaborative work culture seemed to be a highly required element for successful technology integration.

5.1.1.2.4. Teacher Development

Teachers' knowledge and competency were found as some of the key points that could enable effective technology integration. The newly graduated teachers were also expected to have sufficient knowledge of technology and related pedagogical approaches. Amongst the countries in the current study, there were differences between the content and level of courses given at university for ICT skill acquisition and the required ICT skills after becoming an educator.

According to Feiman-Nemser (2001) and Livingston (2012), the professional development of teachers starts when they are still a student in the faculty. Similarly, in Finland, Niemi (2015) explained that pre-service period is the basis for in-service training. Although the quality of Finnish teachers and teacher' education are widely recognized, the current study indicated that the teachers' education was not providing sufficient knowledge and know-how in terms of supporting teachers' ICT use in education in Finland. The number of courses regarding pedagogical use of technology found insufficient at university level. But, the school experience and teaching practice for the teacher candidates was used for making up for this deficiency.

The teacher training schools were seen as a place where "know-how" could be transferred. But for that, the teachers who would be role models had to sufficiently advance their ability to use ICT in order to provide a broader experience to the teacher candidates. The findings showed that teachers' being open-minded and open to change were suggested as the key points for improvement of their ICT skills in Finland.

In S. Korea, the opportunities and necessary experiences for teacher candidates provided at the university were found to be sufficient by the participants. But, the findings also indicated that even if the technology use was advanced to some extent, it still required more work in order to equip teacher candidates with a better set of skills and instructional capabilities. An understanding of pedagogy associated with technology use was to be gained more deeply. This supports previous findings in the literature. It was showed in the study of Kim, Choi, Han and So's (2012) that although the S. Korean universities involved in the study kept the development of pre-service teachers at focal point regarding new media literacy skills and adaptive expertise, teachers still experienced difficulties while tyring to integrate learned new ideas into their teaching process. The researchers indicated that many government, along with the S. Korean, have not designed a set of centralized ICT policies to be practiced in the education process of the pre-service teachers since the universities are academically autonomous. As a result, a variety of approaches have been developed regarding the competencies of ICT development in education through teacher education institutions inland and among countries. Although it was regarded as important that the teachers get assessed in terms of their ICT related competencies by the school and by government while getting recruited or promoted, interestingly, these competencies were defined only as power point literacy by the participants in our study in S. Korea.

In Turkey, even though two opposing views emerged regarding the level of newly graduated teachers’ ICT use knowledge and skills, there was only one common opinion, and it was the necessity of courses related to the pedagogical use of technology for pre-service teachers. Crucially, there was evidence indicated that computer teachers' education was found to be insufficient since there was a gap between the education received and the education needed to be given as a teacher. It is remarkable to note that due to the increase in number of universities, the quality of education provided here found to be decreased. Although the policies related to technology integration [such as FATIH project] were established, teacher candidates graduate from university without gaining the required skills to be able to implement these policies once they become educators.

Professional Development

There are various partners that contributed to the professional development process of the teachers in Finland. Niemi (2015) explains that local providers (the municipalities or cities) are responsible for both educational services and their quality at the local level. School development and professional learning of teachers are often integrated and are under the supervision of local providers. Decisions taken at the local level determine the scope of in-service courses.

In the current study, resourcing courses and expenses through ICT-related projects was a common practice in Finland. The courses would be available depending on teachers’ needs and requests regardless of the existence of state's direct guidance.

Providing opportunities to teachers by cooperating with institutions and individuals was prominent feature of the professional development. Teachers' expertise and peer-to-peer learning at the school level and participating in conferences were also among the common practices. The findings regarding the purpose of in-service trainings are consistent in itself, which is to provide teachers with the knowledge and skills needed to reshape pedagogical practices in schools, particularly in the areas of collaborative teaching and learning, networking and teamwork (Kozma, 2008).

In the current study, there were some problems identified regarding the level, consistency, structure and content of the courses available to teachers even though efforts for enhancing the professional development of teachers' ICT skills were acknowledged in Finland. Firstly, the short-term courses were inadequate to actually acquire the skill-set within the given time. There is only 3 days of official and mandatory in-service training each year in Finland, however, in schools, teachers are spending more time on their professional development (Niemi, 2015). For example, Finnish participants indicated that most of the time, the teachers were responsible of their own trainings, and the course choices. That was because participation in the courses was generally voluntary and the mandatory training days can also be used in another way depending on local decision. Niemi (2015) explained that it was officially true that the country, which had the least in-service time in Talis' review, was Finland, but the survey wasn't able to point out non-traditional school-based projects like "life long professional development" were ongoing to support teachers' learning.

Secondly, location of the training and budget deficiencies hindered the accessibility of the courses. Most of the courses and conferences were held in Helsinki, and the teachers in Joensuu weren't able to attend the trainings even when they were willing to due to the distance and lack of allocated budget to pay for substitute teachers and trip expenses. However, they tried to overcome this issue by inviting experts to their schools or regions as well as applying for school-based projects regarding professional development of teachers.

Thirdly, the absence of advanced level ICT courses was also a deficiency of the system that was spotted. The participants who thought this way were usually the teachers who took in charge as ICT leaders in the school and the city levels. Similarly, in Turkey, although, there were many in-service trainings and courses provided within and beside the FATIH project, some ICT teachers stated that they had hard time to find courses that would meet their needs. Apparently, the courses available in Finland and Turkey are insufficient for teachers who are relatively more competent than average in technology use. Turkish participants explained the reason for these low-level courses with the absence of educators or sufficient number of participants in order to open up a further level course.

In Finland, teachers were still learning the basics of emerging technologies as well as how to use them pedagogically in their classrooms. When an emerging technology introduced to teachers, they initially would take the training related to how to use this technology itself. Then they would move onto learning how to use this tool in learning and teaching activities. Trainings related to pedagogical approaches associated with these technological tools were available at the schools and universities.

On the other hand, in S. Korea, even if there were trainings provided by the government and private companies and institutions, online trainings for ICT skills were mostly preferred by the teachers for individual improvement. In fact, vast majority of professional trainings are already offered online in S. Korea. Additionally, there is no problem with access to the Internet and technology, and everyone uses them in their daily life. For instance, 90.3 % of the South S. Korean population aged 3 and over were internet users whilst 99.5 % of the households in S. Korea have access to the internet as of 2017 (KISA, 2018).

In S. Korea, the trainings were provided within the scope of Smart Education and Smart Learning which were ongoing government projects at the time of our study. The content of trainings included various kinds of information literacy skills, technology literacy skills and pedagogical use of tools. The trainings were not only about how to use the tools but also how to teach with these tools in the classroom.

Another finding worth mentioning is that the certifications and the emphasis on ICT use in the policies were not required anymore since each teacher would be assumed to already have the necessary knowledge according to participants. It seems possible that these findings are due to technology being widespread all around the S. Korea, so that teachers could use technology in their own training programs. Teachers take control of their own learning if needed regarding ICT skills. Teachers could also take ICT qualification courses as part of the mandatory 60-hour optional in-service courses they would need to take in a year. The professional development programme for ICT in education is more needs-driven in S. Korea (Lim, 2012).

Although our findings indicate that professional and in-service trainings in S. Korea are adequate and needs-oriented, Dicolen's (2017) research findings revealed that teachers could not participate in in-service training as well as professional and academic activities due to the overload of workload. This overwork includes providing extra after-school courses, organizing special activities, interviewing parents, and advising students apart from course preparation and education process in the classroom. In addition to the tasks related to education, the teachers also have administrative responsibilities due to the lack of staffing at school and these are usually related to the retention of official records. Stunningly, according to the records, an average of 65 documents per month are sent to teachers for processing (Dicolen, 2017). Perhaps this could explain why the S. Korean participants in our study did not prefer the courses related to the use of ICT in education and were unable to make time to meet with us. Although the constantly emphasized statement that “the use of technology is now known by everyone” is likely to be accurate in terms of literature, the use of technology in the observed classes appeared to be “not advanced” or it didn’t even exist at all. Although the use of technology is known, it has not been observed in practice. It is thought that the reason of this contradiction can be explained depending on how much the pedagogical beliefs of the teachers serve the purpose of the technology.

Different than the Finnish case of trainings provided with local solutions, and S. Korean case of preferring online trainings and reducing the emphasis on ICT trainings, in Turkey there were still emphasis on getting required trainings due to FATIH project. Since the project enabled the access to the technology in the classroom, some teachers found the project encouraging in terms of taking trainings and actually being able to implement what teachers had learnt in the trainings. However, as stated in Gökmen, Akgün and Kartal's (2014) study, the teachers mentioned that they found in-service training to be useful but insufficient in terms of learning the use of interactive board. Correspondingly, in our study, the disagreement pointing that the courses were not useful enough for the teachers had also emerged (Kurt et. al, 2013). Moreover, some teachers from a school that is not part of the FATIH project, stated that it is pointless and unnecessary to receive in-service training on technology as there is no technology at school. Since there doesn't exist an environment in which the knowledge acquired in the courses can be effectively practiced, the interest of teachers in the courses related to ICT may naturally be reducing.

Another issue with the in-service trainings were that for teachers with a certain level of ICT competencies, there were not many advanced courses offered. The available courses were found either too basic or they did not include any new information. Moreover, courses was not being practical and applicable to real-life situations. Thus, they didn't feel the necessity of attending to any courses in Turkey. However, according to many studies in the literature, it has been revealed that teachers still have deficiencies in ICT use capabilities (eg. Altın & Kalelioğlu; 2015; Gök & Yıldırım, 2015). According to the study of Altın and Kalelioğlu (2015), even the students stated that their teachers should receive trainings regarding the use of technology. These problems can be caused by the content, quality and level problems of in-service trainings provided.

The trainings within the scope of the project that were provided by ICT teachers at the school level weren't also found useful. Not knowing to what extent the teachers were able to apply what they learned from these trainings was a concerning issue about school level courses. The teachers also did not want to participate in these school-level courses. While the Finnish participants complained about the short-term courses, some Turkish participants wanted to have a shorter course time and the courses to be squeezed in lunch breaks. It might have been because these courses were considered unnecessary and teachers were not willing to devote their time to the trainings because of their busy personal life beside their day job. Additionally, if a course was not compulsory, it was found that the teachers were trying to avoid these courses by proposing personal excuses. There were those who thought that there was no need for further development beyond basic ICT capabilities since no advanced level of ICT competencies would be taught to students.

In Turkey, trainings regarding how to use the technology itself were provided when a newly emerging technology was introduced at schools. A training on pedagogical use of technology in the classroom were not mentioned by Turkish participants as Finnish and S. Korean participants did. The content of courses and trainings within the scope of FATIH Project were not found very useful since the content remained at a very basic level, and the teachers couldn't associate it with their practices.

Summary of this section

- Although there was a strong emphasis on teachers' training in Finland, this training didn't actually provide teachers with sufficient knowledge and know-how in terms of ICT use in education in Finland. At university level, courses related to pedagogical use of technology depending on a specific subject were found to be insufficient either. It was tried to compensate for this deficiency by the school experience that teacher candidates were gaining over practice at the training schools.

- In these schools, role-model teachers were needed for the transfer of know-how. Therefore, it was important that the teachers in these schools were open to change and remained open-minded.
- Although there was the idea of that everyone can use technology to a certain extent in S. Korea, still it was necessary to improve pre-service teachers' ICT skills. The related courses and education were assumed to be sufficient by the participants involved in the study. However, there was evidence suggested that when pre-service teachers graduated and went to schools to be educators, they had difficulties in technology integration.
- Since there was no ICT policy to ensure the unity of content and the acquisition of ICT related competencies at education faculties of autonomous and independent universities, a difference amongst educators' ICT skills were likely to emerge. Even though the S. Korean government tried to determine the competency level of the teachers by testing their ICT capabilities when teachers were to get recruited or promoted, there was evidence suggesting that the testing criteria did not go beyond than measuring power point literacy of the teachers.
- In Turkey, the courses related to the pedagogical use of technology were required for all pre-service teachers. Specifically, since there was a difference between what pre-service computer teachers learned in the faculty and what they were responsible of teaching when they started their service, it was indicated that their university education was insufficient to some extent. Because of the high number of faculties, it was believed that the quality of education was low in Turkey.
- Unlike other two countries, in Finland teachers' professional learning and school development were supervised and evaluated by local providers. The scope of in-service courses was determined mutually by the municipality, city board, and school community together. Teachers' needs and requests were also taken into consideration in the process of decision making.

- The expenses of courses and trainings were mostly covered by project revenues.
- Teachers' expertise and peer-to-peer learning at the school level and participating in conferences were other practices for teachers' professional development in Finland. Their pedagogical practices were formed by equipping them with the necessary knowledge and skills not only by in-service trainings but also through collaborative teaching, learning, networking and teamwork practices.
- Issues regarding the level, consistency, structure and content of the courses were identified in Finland. The courses were found short-timed for the acquisition of ICT skills. But, teachers were responsible for their own learning. The idea of life long professional development was introduced to teachers. Remote locations of the trainings and the budget deficiencies complicated their learning process. The absence of advanced level ICT courses was also mentioned as a negative effect on further development.
- At the school and their associated universities, teachers would initially learn the basics of recent technologies, then they would learn how to use related tools and devices in learning and teaching activities.
- In S. Korea, the government, private companies and institutions provided sufficient online and face-to-face trainings, but online trainings for ICT skills were mostly preferred by the teachers for individual improvement. The content of trainings would include basic and pedagogical skills related to ICT use.
- There was not too much emphasis on ICT related courses, as teachers were presumed to have ICT qualifications at a certain level. They were able to access related courses whenever they needed. A need-driven understanding for professional development was observed.
- Even if participants claimed that sufficient trainings were provided and they had ICT competencies to some extent, their use of technology was mostly limited to presenting digital material on the TV screen according to classroom

observations. The intense workload shouldered by the teachers, an intensive curriculum and teachers' pedagogical point of view may hinder their ICT related professional improvement.

- In Turkey, FATIH project provided extensive courses. However, while the presence of technology in the classes within the scope of the project could increase the interest of teachers in the trainings, it did not seem possible to make the same inference for the "other" schools due to the lack of access to technology.
- In Turkey, the absence of advanced level ICT courses were identified especially regarding the development of ICT teachers. Since it was difficult to find experienced educators and adequate number of participants for the advanced courses, these courses were not eligible to be given.
- Available courses were regarded as either too basic or not providing new information to add on the basics. Additionally, teachers did not find the content of the courses relatable and applicable to their classes. Thus, they would not necessarily feel like attending these courses even though their ICT skills were not at the desired level. These problems can be formed in relation to the content, quality and level of in-service trainings provided.
- Similar to the efforts of experienced Finnish teachers, ICT teachers would provide ICT related trainings at school. But this effort was found useless and unnecessary by some Turkish participants. Because, there was a doubt about how much the teachers applied what they had learned from these trainings. Teachers were not willing to devote their time to these courses and they tended to ask for shorter trainings. In addition, it was observed that the teachers were likely to avoid ICT trainings by using personal matters as an excuse. There existed some teachers having the opinion that no further development was required exceeding basic ICT knowledge since they were not really responsible of teaching an advanced level of ICT skills to students.

- Surprisingly, none of the Turkish participants directly mentioned the courses regarding pedagogical use of ICT in the classroom as Finnish and S. Korean participants did. Apart from the general idea suggesting that the course content and the trainings within the scope of FATIH project were not quite practical, teachers were also not able to relate the offered content to their actual practices at classroom.

5.1.1.2.5. Parental Influence

In the process of technology integration in education, there are studies in the literature showing that the family that is one of the involved parties has some duties for the effective progress of this process. For example, Kong (2008) considers that parents' support and guidance are critical for the successful implementation of the information technology curriculum designed to promote students' information literacy. Parents should provide their children with such an environment that they should ensure that children use IT for learning and avoid inappropriate use of ICT. Because parents can influence their children's relationship with ICT by providing technology resources, creating learning opportunities and communicating their children's own values and opinions about the use of ICT (Vekiri, 2010). Moreover, the necessity of explaining the difference between the students' ability to use technology not only with the qualifications they gained in school but also with the effects of using technology in the home environment is revealed in the study of Yu, Yuen and Park (2012).

In each case of the current study, parental influence on students' technology use were described differently by the participants. In Finland, financial concerns, parental technology literacy level, and parental permission for technology use in the classroom were emerged as possible parental influences whilst in S. Korea, parental worries and parental values were prominent. In Turkey, the findings revealed that parents' attitude, knowledge and parental guidance were such influences that needed more attention in the process of technology integration.

Some Finnish participants claimed that affirmative or negative attitude of the parents towards technology use at the school would define teachers’ and students’ ability to incorporate with technology in the classroom since sometimes permission of parents were needed for the use of services and equipment in the classroom. For example, the younger students had to have parental permission to use mail and online services in the classroom in Finland. A higher level of technology literacy of the parents would make it easier to have their full support in the process of technology integration in education and help them to understand the process better according to the some participants. This finding may be explained by the fact that while parents with basic ICT skills could observe their children's use of ICT at home as wasting time, parents with relatively higher ICT capabilities were more likely to assist and monitor their children's education (Yu et al, 2012). In a way, ICT skills of parents allow them to participate more in the education of their children. Also from another perspective, ICT has a role in supporting parent involvement in their children’s learning (Lee, Hatherly & Ramsey, 2002).

At some occasions, parents needed to purchase the technology to be used in the classroom in Finland. In this context, limited financial resources of the parents appear to hinder students’ technology use in the school. In connection with this, there is evidence from different countries showed that the socioeconomic status of the family has negative effects on the ICT competencies of both the family and the students (Vekiri, 2010) and students’ exposure to ICT at home (Adegoke & Osoyoko, 2015). However these studies do not reveal any focus on the situation where the families could not get technology for their children to use in school as our study findings indicated for Finnish case. Even though there were very few participants that mentioned financial and permission related issues, most Turkish and S. Korean participants didn’t mention them. This finding can be explained as a case special to Finland caused by school-based project regulations. This is because families can be held responsible if the tablets distributed as a part of the project are damaged at home. These findings thus need to be interpreted with caution.

When financial and permission related issues arose in Finland, the school leaders would discuss this situation with the families and tried to make them understand the technology integration process. Here again, the importance of family participation in the process, decision-making and awareness-raising are emerging. As an advantage of participation and cooperation, parents also needed to take the responsibility of setting limits for the technology use at home as teachers did their part at school.

In S. Korea, the parents worried that students would become addicted to internet and computer games. This may not be an unfair concern in S. Korea. S. Korea is recognized as one of the highly digitalized countries in the world. The percentage of the population, that is between 10-50 years old, who use internet in the daily life is almost 100 per cent, and over 80 per cent between 3- 8 years old (KISA, 2018). Internet penetration rate in S. Korea is very high. After a series of crimes and deaths related to internet addiction, South S. Korea accepted internet addiction as a social and public health problem (Heo, Oh, Subramanian, Kim & Kawachi, 2014). Additionally, according to the national survey of The Ministry of Gender Equality and Family (MOGEF), more than 15 percent of elementary and secondary school students in S. Korea suffer from digital addiction (smartphone, internet, online games, YouTube video content) (MOEG, 2018). In order to overcome the problem of digital addiction, the S. Korean government developed both projects and policies covering students and their families (see. Doh, Rhim & Lee, 2016). However, the parents still wanted their kids to have all the opportunities that could be provided to others. That could be the reason why the teachers put a lot of effort into preparation of open-class activities. They wanted to show parents how their kids got educated. Teachers would incorporate technology more in their teaching during open-class activities, because they thought that the parents would like to see that their kid had all the opportunities for their education in S. Korea.

In Turkey, some participants claimed that there was a need to increase awareness among parents regarding the contribution of technologies to the learning and teaching processes. Because they believed that the lack of knowledge and awareness of parents could be a barrier for educational technology use. Strikingly, according to the Eurokids Online Project involving 23 European countries along with Turkey, the ICT skills and the knowledge of internet of the Turkish parents participating in the study ranked the lowest among the other participant countries (Karakuş, Çağıltay, Kaşıkçı, Kurşun & Ogan, 2014). Correspondingly, the research on FATIH project and parents' view on the project showed in a consistent manner that families still didn't have enough knowledge about the project (see Ekşi & Yeşilyurt, 2018; Şahin, Aktürk & Çelik, 2013) even if FATIH project was considered as an educational innovation by the parents as well as by the students and teachers.

In our study, according to the statements shared by the participants, parents thought that their kids were already technology literate, since they could use internet and computer. Inaccurate insight, knowledge and perception owned by the parents regarding the competency level of their kids didn't help them to understand the necessity of technology use for educational purposes. They also wouldn't see ICT lessons as important as some other lessons. This could be related to families' perspective on technology. For example, in the study of Şahin et al. (2013), five of the 20 parents participating in the interviews reported that the use of computer in education was unnecessary. Since parents do not know enough about the projects and they have unrealistic perceptions about their children's use of ICT and they don't really know how much technology can contribute to the educational process, the families, as one of the involved parties, may not be able to provide enough support for children.

It is found that in students' effective and controlled use of technology, many different factors such as parental ICT skills, monitoring, control, guidance (Kim & Lee, 2011), worries (Yu et al, 2012), support (Seo, Kang & Yom, 2009), socioeconomic status of the family (Vekiri, 2010), parent-child relationship (Doh et al., 2016) play an important role. Similarly, in Turkey, teachers mentioned such factors and indicated that the family has a role in technology integration. According to the participants, the parents were considered as role-models, rule makers and enablers for technology use both at school and at home. They were expected to set rules related to technology use at home to enable a beneficial practice. However, the parents got worried about the possibility of excessive use of tablets at home for non-educational activities and they banned technology use entirely instead. The behavior of the family cannot be considered as appropriate. This may indicate poor communication and guidence. Findings of Yu et al. (2012) showed that families who communicate better with their children and guide their children can better control the time their children spend on computers. This controlling behaviour revealed that children spend more time on educational activities while using computers, compared to the children of other poorly communicating families.

In each country, the effect of the family has emerged differently. This may be because they are in different stages in the process of technology integration. In addition, the behavior of patterns and concerns of the families may differ due to the current state policies, knowledge level of the family and their socioeconomic status and culture. However, these differences do not eliminate the role of the family in the process of technology integration for each country.

A low rate of technology use by the parents may have a negative effect on their guidance for their children (Kim & Lee, 2011). It is clear that the parents also need to receive guidance and education regarding technology use in order to maximize the benefit for the children because parents have a significant effect on their children's technology education. Families may need more information and guidance on processes and policies. In order to ensure the commitment and belief in the effectiveness of projects and practices, more briefing on the objectives and planning should be provided to parties including parents (Ekşi & Yeşilyurt, 2018).

Summary of this Section

- While issues such as ICT competency level of the parents, their permission for technology use in classroom were prominent as the possible parental influences along with the financial issues in Finland, parental worries, values and beliefs were to be discussed accordingly in S. Korea.
- In Finland, parents' affirmative or negative attitude towards technology use would determine the extent technology can be used by teachers and young students in the classroom due to a necessity for parental permissions to use online services. Additionally, some participants believed that parents with high ICT competencies and knowledge could easily understand and support the process of technology integration in education.
- Parents' limited financial resources may affect students' technology use negatively in Finland, since sometimes they needed to purchase technology for their children's use at the school.
- In order to solve parent-related issues, the leaders would meet them and try to raise their awareness about technology integration process and its requirements. The parents would also be included in decision-making stages of technology integration process to some extent.
- Internet and computer game addiction were the main concerns of S. Korean parents. However, the government developed projects and policies for both students and their families to overcome possible and existing addiction problem.
- Open-class activities were important since they involved parents' participation. Teachers would incorporate more activities including technology use, because teachers believed that parents would like to see their children were educated in the best possible way.
- In Turkey, there was a need for increasing the awareness among parents regarding the contribution of technologies to the learning and teaching processes.

- Turkish parents were confident that their child was already technology literate enough. Parents did not seem to really comprehend the requirement of technology education since they mostly had a false impression about their children's ICT competency level and misperceived the situation Therefore, ICT lessons were not considered as important as other science lessons by the parents. Unrealistic perception of the parents about their children's knowledge and importance of technology in education may prevent them from supporting the process of technology integration effectively.
- A poor communication and guidance were evident at home. The parents were concerned about students' excessive use of tablet PCs for non-educational purposes at home, so they did not allow their use of these devices at all. However, teachers defined the role of parents in the integration process as role-models, rule makers and enablers.
- The guidance, information and education regarding technology use were needed to be provided for parents to maximize the benefit derived by children in each case.

5.1.1.3. RQ1c. At micro level

5.1.1.3.1. Approaches to Developing Students' ICT Skills

The findings showed that each country adopted different approaches for technology integration in education. These approaches regarding the integration of ICT into curriculum included a separate ICT course, across the curriculum and a combination of course and cross curricular work. There are countries that have adopted different perspectives, not only the countries we selected for our study but also in the world. The data shared through learning represents that whether ICT is regarded as a separate course, namely computer science, or not varies across Europe (Balanskat, Blamire & Kefala, 2006). Countries do not really agree on that especially for primary schools. For example in a total of 15 countries, ICT is not provided as an individual course itself, however in 11 European countries it is a separate course indeed. Although these are the numeric facts, not regarding ICT as a separate course really tells something about the importance attached to it if we base on the data shared in learning (Balanskat et al., 2006). These can be a process which may vary according to their readiness, level of integration and their managerial and value judgments.

A holistic approach was adopted for students to acquire and develop ICT skills in Finland. A set of ICT skills and competencies were embedded in the objectives of the courses across the curriculum. It was essential to teach the content knowledge and ICT skills together. But, still some point of interest courses were provided to help students to advance their specific skills at secondary schools. The knowledge and availability of teachers as well as students' request would determine the content of these courses. Since there were not an ICT specified teacher in the schools, each and every teacher were responsible to teach ICT skills at the primary schools. If there is a student who is not able to do the task given to be done by using the technology, the teacher immediately intervenes and teach how to use the technology for this task in particular. It was aimed to establish such standard among students' ICT qualifications. These practices and perspectives in Finland differ from the ones in Turkey and S. Korea. In Finland, a few dozen years ago, independent computer lessons were taught, but ICT qualifications were integrated throughout the curriculum, with emphasis on the use of ICT and the coding more than the previous curriculum. Despite this, a few participants stressed that they want the informatics course to be given as a separate course. Because they still thought that the students did not have the skills to use ICT effectively and that it would be more effective to teach with a separate lesson.

On the other hand, in S. Korea and Turkey, ICT courses were provided as an independent subject itself. However, the understanding of these ICT courses in S. Korea was different than Turkey. Because, even if those courses had independent status, the objectives of courses was not dedicated to teaching only how to use technology. There was a shift in the course objectives from teaching how to use technology to teaching how technology actually works in S. Korea. Acquisition of ICT competencies weren’t seen as an isolated learning objective. The competencies were embedded into technical lessons as well as other subjects. Once again, the findings indicated that teaching ICT skills was not regarded as important as it was before, because students' ICT skills thought to be reached at a certain level already. For this reason, including ICT-related lessons into school schedule was not mandatory and each school did not need an ICT teacher according to participants.

Homeroom teachers, other subject teachers, technology teachers if there was any, teachers of afterschool and private institutions would help students to learn ICT literacy anyway. The findings showed that ethical use of technology were their primary concern rather than teaching how to use technology itself. The reason for that might be the informatization and information ethics education that were considered as themes for Cross Curricular Learning with the objective of an integrated education covering all related subjects and Creative Experimental Activities (KERIS, 2014). Since 2001, information ethics education studies has been conducted by the state targeting a wide range of people consisted of teenagers, teachers, parents or local residents for the purpose of providing informatization society with consciousness regarding ethics (KERIS, 2015).

In S. Korea, the students were also expected to learn the ICT literacy by themselves due to having a well-developed technology infrastructure according to the participants. Students were able to take after-school classes if they were interested in technology use. The students’ ability to use ICT was thought to be better than the teachers. Just like S. Korean participants stated, there existed a common viewpoint also in Turkey that the highschool students are able to develop their own ICT competencies. Similarly, students were thought to have more ICT competencies than teachers. However, these findings did not give a clue about whether the students were good at using ICT for educational purposes or not. Contrary to our expectations, what teachers were usually implying while speaking of students’ ICT literacy were the daily things such as their ability of chatting, searching and e-mailing (Kim, Kil & Shin, 2014).

In Turkey, there was no objection to a holistic understanding of the acquisition of ICT skills, the ICT course and ICT teachers found to be necessary for the students to gain sufficient ICT skills. There were also those who highlighted that the ICT course time should be increased, because the ICT capabilities of the students were not standard and sufficient. But, interestingly none of the high school teachers who contributed to the study mentioned that they were responsible of helping students to develop their ICT skills in the process of implementation of FATIH project. In addition to this, the computer teachers in high schools found to be focused on FATIH Project components rather than teaching ICT skills to the students. The findings did not provide a point of view that teaching ICT skills should be the responsibility of each and every teacher as it was the focal point in Finland. A possible explanation for this might be that teachers may not want to make such an effort because there was already a computer teacher at the schools. Teachers may perceive the concept of technology integration into education different than policy-makers and leaders (Ekşi & Yeşilyurt, 2018).

It is interesting to note that in S. Korea, the government tried to integrate the technology through the smart education initiative in primary and middle schools, since technology was not used commonly. In Turkey, the implications of FATIH project initially began at the high school level. The FATIH project was an attempt to embed ICT skill acquisition into subjects, but the current study revealed that in general, teachers were using the technologies provided within the project, and students were not given the opportunity to practice their ICT skills so much. The present findings seem to be consistent with another research which found that FATIH Project passivize the students instead of activating them by grabbing their attention and increasing their involvement in classes (Yolcu & Bayram, 2016). Similarly, in another study, the lack of interaction function between the interactive board and the tablet PCs is seen as a reason by teachers to put students in a passive mode and create an environment in which it is almost impossible to incorporate them into the content (Pamuk et al., 2013). However, this situation has been explained by Pamuk et al. (2013) as a pedagogical problem related to classroom management, even if it seems as a technical barrier at first glance.

Summary of this Section

- In the study, each country adopted different approaches against technology integration in education. Finland adopted a holistic approach for students to acquire and develop ICT skills. On the contrary, ICT course was provided as an independent subject itself in Turkey and S. Korea. However, despite this fundamental similarity, the understanding of the mentioned ICT courses in S. Korea was different than Turkey. Because even though these courses have an independent status, the aims of the lessons were not solely to teach how to use technology. The course objectives were transformed from teaching how to use technology into teaching how technology actually works.
- In Finland, ensuring the gain of ICT qualifications for the students was accomplished by incorporating this purpose into the objectives of each subjective included in the curriculum. There was not specifically an ICT teacher in the schools. Therefore, each and every teacher were responsible of teaching ICT skills at the primary schools.
- A number of elective courses were provided to help students advance their specific ICT skills in secondary education. The demand that would come from the students with the knowledge and availability of the teachers would determine the content of these courses.
- When students experienced problems with the use of technology at the classroom, teachers intervened immediately and taught them how to use technology in order to ensure a standard level of ICT skills among the students at the primary schools.
- In S. Korea, although ICT courses had an independent status, the acquisition of ICT competencies were not seen as an isolated learning objective. It was

expected to be gained through technology use blended in the other courses along with the technical courses.

- In S. Korea, teaching ICT skills was not seen as important as it used to be before, because the ICT skills of the students were assumed to be already at a certain level. Therefore, the inclusion of ICT-related courses in school programs was not mandatory at all and ICT teachers were not particularly required.
- Teaching ethical use of technology was prominent in S. Korea since there were ethics related problems and the government has long given importance to this issue specifically.
- Especially in S. Korea and Turkey, it was emphasized that the students had better ICT skills than teachers, but it was not clear whether superior skills were related to technology use practiced in purpose of academic learning. Participants were more likely to talk about the daily use of technology. In these two countries, at the high school level, students were believed to be able to develop ICT skills on their own.
- In Turkey, independent ICT courses and ICT teachers were found to be necessary for the students to gain sufficient ICT skills. There was no evidence of a holistic approach accordingly. While each teacher was responsible for contributing to the student's ICT competencies within the scope of FATIH Project, the participants did neither mention such responsibility nor showed an effort in the classrooms during observations. Counting on the existence of ICT teachers in schools, teachers from the other branches might not be totally aware of this responsibility to be shared or the understanding of technology integration may differ among teachers due to the existence of different leaders and policy makers that are establishing the concerned enforcements on them.
- In Turkey, computer teachers in high schools were mostly focused on fulfilling the requirements of the FATIH Project and as a result, they did not seem to value teaching ICT skills to students as a top priority.

- FATIH project aimed to promote both teachers' and students' ICT skill acquisition as well as their use of ICT in the classroom. But since available technologies were generally used by the teachers themselves, the opportunity to use them was hardly given to students during the lessons. Although it is said that this was because of the incompatibility issues among available technologies, there is also the possibility of that this was resulting from the difficulties encountered related to the pedagogical use of technology.

5.1.1.3.2. Reasons of ICT Use

In each case, a technology would be used in the classroom because it could afford to enrich learning experience of the students, provide instant access to limitless information and course material, and improve students' motivation in the current study. It is critical to note that those who stated that the use of technology could increase the motivation of the students towards the lesson were mostly Finnish participants. Additionally, in Finland and S. Korea, technology was used for encouraging collaboration and communication unlike Turkey. It was interesting that the findings did not provide any evidence about the use of technology for enhancing the interaction between classmates and instructors in the classroom in Turkey. Similarly, in some of the research conducted in Turkey, there exists some statements provided from the teachers' point of views about the technology use making students inactive somehow (see. Yolcu & Bayram, 2016). In the research of Kurt et. al (2013), it was concluded that interactive boards were mostly used for the activities that could also be done simply by using a computer or a projection device. This can be explained by the change in purpose of making a difference in educational class activities to make them more student-centered, which is one of the main objectives of FATIH Project, did not happen completely yet.

Moreover, in another study conducted in Turkey, the teachers from schools participating in FATIH Project explained the reason why they were not able to have their class in a more interactive way as the disconnection between interactive boards and tablet PCs (Pamuk et al., 2013). However, although this may seem like a situation caused by technical problems at first glance, it may be caused by problems related to pedagogical approach and classroom management (Pamuk et al., 2013). Because, according to the observations and interviews in Finland, there were smart boards and tablets in the classroom environment, and even if they pointed to the mismatch of operating systems of the machines, teachers did not mention that this affected their pedagogical approach. In S. Korea, similar to Finland, such problem was not reported.

The findings suggested that the use of technology was mostly for the diversification of the way of delivering the content and enhancing the visualization of the content in Turkey. This substantiates previous findings in the literature (see. Kurt et al., 2013). At high school level, the technology was especially used in order to increase the number of questions solved in a period of single class in the case of Turkey. It was also a time saver for teachers (Altın & Kalelioğlu, 2015). This supports the concept of teaching for exams. But, it was not clear whether solving more questions with the help of technology was increasing the success of the students or not. Some participants specifically questioned this situation. Those who had the same concerns were not only teachers. In the study conducted by Altın and Kalelioğlu (2015), considering the place of FATIH project in the courses, the students were indecisive of whether the FATIH Project was beneficial in general, whether it made them gain different skills, and whether it had an impact on their academic success and also whether it was a well prepared and well practiced project or not.

The findings revealed that while the use of technology would diversify and enhance teaching and learning methods in Finland and S. Korea, it would diversify the way of delivering the content, and concretizing the abstract concepts in Turkey. This finding is in agreement with Pamuk et al's (2013) findings which showed that teachers were using the smart boards in order to show presentations and course related documents instead of enhancing the teaching and learning experiences as they claimed to do so. As revealed, interactive boards were mostly perceived as projectors with the internet connection by the teachers (Kurt et al, 2013; Pamuk et al., 2013). Participants from each country involved in this study and contributing to the establishment of this headline indicated that they all would use technology to achieve teaching objectives effectively. The reason for the emergence of this difference among countries could be that there may be differences amongst the definitions of how to teach effectively with the help of technology.

Another finding worth noting was that most of the participants agreed that ICT was just a tool and should be used only when necessary. They also suggested that technology needed to be used in a balanced way in the classroom, since the use of it was not really one of the objectives of the learning process. The necessity of avoiding continuous use of technology was highlighted. The findings of our study indicate that participants in each country have the awareness that technology was not a goal but a tool. However, while the use of technology in countries were similar with respect to what affordances of the technology can provide, pedagogical practices related to technology integration in education differed amongst the countries. In developing countries, the understanding of technology as a mere tool generates the concept of technology use for supporting the implementation of the curriculum rather than the use of technology as a pedagogical instrument. Similarly, Ra et al. (2016) described this situation in their discussion paper as one of the current challenges in developing education in Asia and the Pacific, and they emphasized the need to reorganize the curriculum for the purposes of using technology to overcome the challenge. It is a must for the curriculum at the national level to be developed around the possibility of ICT integration into education along with ICT related demands such as creating a better learning environment. ICT is remained to be considered as a supplementary educational tool in a lot of developing countries. Point of views supporting this belief are evolving. ICT is being used as a key element to make courses more appealing to the students. Moreover, besides, some learning objectives like multi-literacy or digital literacy can be obtained through ICT-enhanced learning environments. Educational approach or any vision accordingly can not be shaped by ICT existence alone or ICT can not be employed to make up for incompetent pedagogical practices (Ertmer, 2005).

In each case, the content and objectives of the lesson would define the use of technology according to participants. While some Finnish and Turkish participants also pointed the needs of students as a determinant, some S. Korean participants mentioned availability of the tool as a determinant for corporating technology into lesson.

Different than other two countries, in Finland, the teachers would adopt a trial-and-error approach to decide whether to use a new technology in their classroom. Surprisingly, the consistent findings and observations throughout the study reflected that S. Korean teachers believe that good education could be provided without using technology at all. May be this might be the reason why not much of a technology use was observed during the study.

Summary of this Section

- While technology was used in Finland to increase the motivation of the students in relation to the lessons, S. Korea and Finland were particularly used to facilitate collaboration and communication unlike Turkey. As the reasons to technology use, increasing the motivation of the students or improving the interaction amongst teachers and students were not particularly stated by the Turkish participants.
- The use of technology with more student-centered activities as one of the aims of the FATIH project as well as the national curriculum apparently was not realized to a significant extent. It was explained by the lack of interaction between smart boards and tablet PCs and classroom management problems. However, even though incompatibility issues between devices were reported in Finland also, there was no evidence indicating that they abandoned their use

of technology and changed their pedagogical approach in total. Similarly, S. Korean participants didn't report such issues neither.

- In essence, all of the participants were utilizing technology to accomplish course objectives in an effective manner. There may be differences between the understandings of achieving course objectives effectively across countries. In Turkey, the participants mostly incorporate available technology in the classroom for the diversification of the way of delivering the content and enhancing the visualization of the content also. On the other hand, in S. Korea and Finland available technologies were used to diversify and enhance teaching and learning methods.
- In Turkey, smart boards helped teachers to solve more questions in a certain time period contributing to the purpose of preparing for exams. This could provide evidence for an exam-oriented perspective regarding technology use. However, teachers had doubts about positive effects of solving more questions on students' success.
- According to participants from each country, technology was merely a tool that should be used when necessary and the use of technology should not become the sole purpose of the course. Although there were similarities between participants' technology use as a tool, these similarities seemed to vanish when it came to interacting with technology as a pedagogical instrument.
- The use of technology in the classroom would be determined in accordance with the objectives of the lesson in each case. While another determinant was the educational requirements of the students in Turkey and Finland, S. Koreans tended to consider the availability of the tools at first. Additionally, different than other cases, in Finnish case, a trial-and-error approach was observed to be adopted in order to decide whether to use a new technology in their classroom or not.

- In S. Korean case, some participants believed that a good education was possible to provide without any technology assistance really. This might explain why the observations revealed that they didn't incorporate technology much in the classroom.

5.1.1.3.3. Misuse of Technology & Students ICT Competency

If a proper utilization of ICT can not be established, ICT use may be disadvantageous more than it becomes beneficial (Mikre, 2011). By using technology in education, while many things can be done by making use of its affordances, it is most likely that only a small fraction of its potential may get used by students and teachers. In our study, the findings indicated that the teachers from the three countries had concerns about the ICT competencies of the students that were necessary for performing learning activities. Because, even if they thought the students had better ability to use technology than the teachers, most of these abilities were not used for educational purposes by the students. Thus, the ability of students to use technology was considered as both an enabler and a barrier for the integration of the technology into education depending on their proficiency level in technology use for educational purposes. Generally, students have a tendency to use technology for amusement instead of educational purposes, which may be named as the misuse of technology in that respect (Mikre, 2011).

For instance, Finnish, S. Korean and Turkish participants indicated that while the students were good at using computers, tablets, phones or digital environment for entertainment purposes, they were not as good and effective at utilizing them for educational and instructional purposes. Moreover, according to the statements of some participants from contributing countries, students have a perception of themselves as very competent in educational use of technology, however in fact, their competency did not cover any other ability rather than technology use for entertainment. Those findings may be pointing to a huge gap between the intentions of the educators and actual outcomes derived from the students. Ryberg, Dirckinck-Holmfeld and Jones

(2010) indicated the requirement for a more organized exertion regarding the pedagogical support for the students to help them develop ICT skills. They also suggested that while focusing on how to meet the needs of this digital generation, it must be taken into account that the members of this generation are already heavy users of technology giving them experience and skills prior to their education. Still, this Net Generation will need further guidance and support to learn how to use technology for educational purposes too.

Besides, the reason that the students don't use technology for the educational purposes as much as desired may be explained in association with the idea that the technology education tends to lose meaning to some point (Leu, O'Byrne, Zawilinski, McVerry & Everett-Cacopardo, 2009). Every 10 years, probably in a shorter period, the definition of ICT literacy, the qualifications that the students need in that year and in the future are changing due to the rapid advancement of both technology and knowledge. For example, the required level of technology may have meant something for the use of computers in the early 21st century. However, today, young generation that is called "digital natives" or "Google generation" or "Net generation" are able to use computers, social media and digital media with ease. Of course, this situation does not mean that the young generation are also able to overcome the technical problems and use them in the desired direction. Although a lot of students experience technology use on a daily basis as a part of daily life, they will still require professional help to transform these knowledge into an ability of educational use which includes source evaluation, knowledge gathering, doing research, synthesizing and presenting information as a whole (Jones & Shao, 2011).

Our study is similar to the findings of some studies conducted separately in S. Korea and Turkey with the finding that students use the technology more actively except for educational purposes. In the literature, the reasons for non-educational use are explained by digital or gaming addiction, and it seems that students do not need to develop higher level ICT competencies because the use of daily technology can be sustained with low thought and low knowledge-oriented competence. In our study, only in Turkey and S. Korea, the concerns related to the existence of technology addiction among students were disclosed. Finnish participants didn’t mention addiction, but some Finnish participants expressed their concerns about that excessive technology use would interrupt students’ face-to-face social interaction. A possible explanation for no reported addiction in Finnish case might be that Finland was classified as “higher use, some risk” country in Eukids Online project (Haddon & Livingstone, 2012) and students’ self-regulation over the technology use (Arnesen, Elstad & Christophersen, 2017), which means that there is a high level of internet use in Finland but there exist only some risks accordingly. This situation is explained by the effective awareness-raising campaigns conducted, regulatory strategies adopted or applied strategies of parental mediation in relation to children’s internet use.

In Finland, only a few teachers indicated that students’ ability to use technology were mostly limited to entertainment purposes. Finnish participants didn’t complain about inadequacy of students’ ICT skills as much as Turkish counterparts did. In fact, Finnish children were mentioned as possessing more digital skills than the children had in other European countries, which also included Turkey (Haddon & Livingstone, 2012). A major study conducted in Finland remarked that children’s technology skills were heterogeneous when basic, advanced and professional levels were considered at basic and upper secondary education level (Kaarakainen, Kivinen & Vainio, 2018). In reference to students’ area of interest, the field of education in question and the age of the students, it was explained why students owned these heterogeneous skills regarding ICT. This heterogeneous student profile may give a reason for the emergence of reported misuse of technology by the students in Finnish case.

In S. Korea, the findings of Cha el al.’s (2011) study showed that the expected competency level from students doesn’t increase as much as required as they advance to next grade in school. Although the technology and internet exposure process of students increase, they explained this situation as this process was focused on gaming or internet and the students' ICT knowledge and skills were not developed enough. In addition, although many reports have been published on informatization (infrastructure), education informatization, and Internet usage in S. Korea (e.g. White papers, OECD reports), Cha el al., (2011) drew attention to low thinking-oriented and low knowledge-oriented competence along with high gaming and internet use rates. Interestingly, according to the results of the study by Kim et al. (2014), the use of computers for education in S. Korea was not strongly associated with ICT literacy. While it was expected that the more the students used computers to study or do homework, the more they gained ICT literacy, they seemed to gain a lower level of ICT literacy in the end. It is suggested that ICT literacy is more related to daily computer use (news reading, daily life knowledge, games) for purposes not related to studying.

Similar to S. Korea, some studies made in Turkey reveal that students are using tablet PCs, interactive boards and internet for non-education purposes such as gaming and watching videos in the class or in break times (Altın & Kalelioğlu, 2015; Karakuş et al., 2014; Yolcu & Bayram, 2016). Moreover, since students are not allowed to install applications other than the ones that are defaulted to the tablet PCs, students use tablet PCs out of purpose by installing games and other software by breaking protective codes (Pamuk et al., 2013; Yolcu & Bayram, 2016). Additionally, while students can use their daily computer skills for fun or time-consuming purposes, they are valued as inadequate by teachers in terms of their use for learning purposes. Interestingly, Yolcu and Bayram (2016) provided evidence that this problem was not limited to students, but also includes teachers. In accordance with this, our study revealed that while teachers are sitting in the teachers' room during break times or in their spare time between classes, instead of interacting and communicating with one another, they appeared to play games or use social media from their mobile phones and tablet PCs. It is crucial to note that our findings indicated that students didn't see technology as a learning tool from the point view of the participants in Turkey. This may explain why students don't use technology for educational purposes.

As another finding indicates, difficulties in maintaining focus on the content while using technology in the classroom were reported in each country. Especially Turkish participants indicate that the student would abuse the right of technology use in the classrooms. This would prevent them from focusing on their schoolwork. The technology may be functioning as a tool of distraction in this regard. Moreover, in Turkey, the restricted school internet and tablet PCs given under FATIH project found to promote undesired behavior of the students in the classroom. Again, it is pointed out that the use of tablet PCs creates a problem with classroom management. Similarly, in studies in the literature, teachers stated that class management was harder due to the decrease in eye contact and interest of students in tablet computers (Altın & Kalelioğlu, 2015; Kurt et al, 2013; Pamuk et al, 2013). In addition to these, especially in the research of Kurt et al. (2013), it was stated as the management related problems in classroom that as soon as the students find an opportunity, they directly connect to the internet and teachers fail to control the tablet use. Students would abuse the right they had to use technology in classrooms by using their phones, tablet PCs, and smart boards for personal reasons.

Only Turkish and S. Korean participants arose the moral and ethical issues of technology use as misuse of technology. Social networks and cyberbullying, academic honesty and research ethics, and privacy issues were addressed as ethical and moral issues emerged from students' inappropriate use of technology. Although the most part of the kids in Finland had access to internet, the reason why we did not mention this kind of situation in our study might be parents' active mediation rather than restrictive one at home, teachers' mediation and peer support at school (Haddon & Livingstone, 2012). In S. Korea, the findings of Jung et al.'s (2014) study associated the cyberbullying behaviors of elementary and middle school students (11-14 years old) with problematic internet use as well as various psychopathologic symptoms. Similarly, some studies from Turkey also mention cyberbullying as a major problem (see. Yılmaz, 2011; Karakuş et al., 2014). While in the study of Jung et al. (2014), it was stated that increased awareness makes it easier for parents, school and health officials to identify the cyberbullying incidents and eliminate the results right away, Yılmaz (2011) suggested that schools should establish a policy against cyberbullying at first considering it was detected to exist even in Turkish middle schools. A greater attention is required for the detection of cyberbullying among youngsters. Additionally, both parents and the kids should be informed about how to cope with these kind of issues such as cyberbullying, and the required legislative regulations must be made accordingly (Karakuş et al., 2014).

While Turkish participants complained about students' lack of self-control over the use of their devices, Finnish participants expressed the importance of students' self-regulation over the technology use. Furthermore, Finnish participants suggested that providing enough freedom to use technology would help student to learn self-regulation. Our findings related to Finnish case is in line with the findings of Arnesen et al.'s (2017) comparative study between Finland and Sweden. They suggested that teachers instructional statements, management in classroom and expectation mentioned are shaped around self-regulation of the students. It was concluded that different approaches implemented by the teachers has an impact on the choices that students would make regarding how to spend their online time in class. Moreover, it can be regarded as a significant element in promoting self-regulation among students that how much they give value to the school and teachers as an educational institution and educators. Furthermore, when students appreciate school environment, it may help them face internet access related problems more calmly while they are getting involved with technology and internet to do the given tasks. Base on this, it may be said that one of the cases in Turkey suggesting that in technology enhanced classes, teachers are experiencing problems due to class management and appreciation of the educator can affect the students' technology use in classroom. The lack of the self-control concept in students also draws attention as an aspect to help explain why students misuse the technology in the classroom.

Summary of this Section

- In each country, the students found to be good at using computers, tablets, smart phones or digital environment for entertainment purposes, but not instructional purposes. However, it was said that the students thought that they had good technology utilization competencies.
- In each country, teachers had concerns about the ability of students to use technology for educational purposes, even though they had acknowledged that students' abilities to use technology as a mere tool were better than the teachers. Therefore, it would be logical to say that the ability of the students to use the technology for learning purposes would facilitate the integration to a significant extent.
- While in S. Korean and Turkish cases, students' digital and game addiction were disclosed, in Finnish case, excessive use of technology was not approved or favored since this may weaken face-to-face social interaction greatly. The over-exposure of students to technology did not exactly make them an effective user.
- The Finnish teachers appeared to overcome risk factors regarding the internet use by helping students to learn self-regulation.
- In Turkey, it was mentioned that students didn't perceive technology as a learning tool. Maybe that was why they used tablet PCs, smart boards and other devices for fun or time-wasting purposes. The students could alter the settings of the devices in order to download games and other unauthorized applications, but they could not use them for learning purposes. The restricted content of internet and tablet PC may be reducing the students' motivation and interest regarding technology use.
- In Turkish case, not only students but also teachers seemed to have technology addiction problems. In their break or spare time, they would concentrate on their phones or tablet PCs instead of interacting and communicating with each other in the teachers' room.

- In Turkish case, students would covertly use their smart phones and tablet PCs for personal reasons during the classes. This would make it hard to focus on the subject.
- The moral and ethical issues concerning the misuse of technology were brought up only by Turkish and S. Korean participants. Student's misuse of technology was associated with the misuse of social networks, cyberbullying, academic honesty and research ethics issues, and the violation of privacy. Although most of the youngsters in Finland have access to internet, any concern regarding this issue was not reported. This might be because the parents in Finland were mostly involved in active mediation rahter than adopting a restrictive approach against technology use and also due to teachers' mediation and peer support at school to a high extent.
- In Finnish case, the importance of students' self-regulation over the use of their devices was prominent. It was essential to improve self-regulation competencies of the students instead of putting restrictions in order to prevent the misuse of technology. On the contrary, in Turkey, one of the common complaints that were encountered with was the students' lack of self-control, but the teachers did not provide any evidence related to their responsibility for overcoming this problem.

5.1.1.3.4. Teachers

External Force

Within the context of this study, no necessity of strong external forces in order to enforce ICT use of Finnish teachers in the classroom was observed unlike for the other cases of the study. Finnish teachers' technology use was not emerged in connection with the teacher inspection and evaluation policy they have or a rule brought by a specific project regarding their ICT use in the classroom. The Finnish teachers stated that they incorporated technology into classroom because they believed that the use of technology in education would enable the students to grow up to be ‘good citizens’. However, it should be still kept in mind that the requirements of technology related projects in each individual school strengthen teachers’ use of technology in Finland. Even within the scope of the projects, teachers' autonomy is recognized by giving them the right to choose whether they would like to use technology or not. Instead of forcing teachers into the use of technology, they are accustomed to the idea of using technology gradually, and the leaders encourage teachers to make choices in this direction. This attitude may be shaping teachers' awareness and beliefs about the use of technology in education in Finland. On the other hand, S. Korean and Turkish participants indicated that they felt the need to use technology due to teacher inspection, evaluation policy or requirements enforced by a project. These findings are rather disappointing, because S. Korean and Turkish teachers needed to have a compelling external factor to get more involved with ICT. There could be several possible explanations for this finding.

First one is that there may be a lack of teachers’ belief in effectiveness of technology. Inan and Lowther’s (2010) study provided significant evidence that technology use can be explained by accounting teachers’ belief as one of the vital factors accordingly. The establishment of a positive approach through technology emphasizing the value of it increases the instructional technology use by the teachers and with the constructivist methodologies, it spurs the transformation of their perception against technology as an instructional tool (Shin et al., 2014). Likewise, teachers get highly affected by their beliefs regarding the benefits that innovations hold while choosing whether to use technology for instructional purposes or not (Ertmer, 2005). For example, in a S. Korean study, the main motivation of teachers in the use of technology was found to be meeting the requirements enforced by the government instead of getting motivated by the value they might add to the educational process (Baek et al., 2008).

In Turkey and S. Korea, the policies set to increase the use of technology in education are clearly visible. In S. Korea, MoE and local authorities require K12 teachers to use ICT as a tool in the classroom as 7th National Curriculum obligates teachers to perform 10% of each class activity by using computer in any subject since 2001 (Kim & Santiago, 2005). Similarly, FATIH project has been implemented as an attempt to realize national science and technology policies in education in Turkey since 2010. However, these obligations were criticized for not taking teachers' beliefs about education and their competencies into consideration. In an environment where there are rules, policies and practices that do not pay regard to teachers' beliefs and abilities, teachers may not be expected to develop a positive point of view about the use of technology. Therefore, teachers may be using technology only for the sake of fulfilling the enforced requirements. For instance, Ekşi and Yeşilyurt's (2018) findings peremptorily showed that the priorities, the problems encountered, the beliefs and the commitments differed between the policy makers and those who implemented the policy. A top-down change is unlikely to take place without the practitioners' belief in this change. Therefore, to ensure teachers' commitment and the faith in the effectiveness of technology use for attaining instructional objectives, the goals and planning of the project should be explained clearly to teachers, students, parents and school administrators (Ekşi & Yeşilyurt, 2018), teacher training programs should challenge teachers to maintain awareness about the idea that the technology can be used for enhancing instructions and learning process (Baek et al., 2008).

Second one is that this result may be emerging by since each country has different school and teacher evaluation systems. For example, in the early 1990s, school inspections were abolished in Finland (Taipale, 2012), unlike the other countries in the study. Currently, educational policy decisions are supported by the evaluation data on school activities and performance that are regularly collected in Finland. These confidential data on individual schools are being used by only the schools and their maintaining organizations for their own development. On the contrary, in Turkey, similar to S. Korean case, teachers' ICT use were not inspected or regulated by higher authorities on the purpose of giving feedback. For example, some Turkish participants indicated that they were not provided with neither feedback nor any data on how the technologies used in the FATIH project had an impact on their teaching. The absence of a solid feedback mechanism has been criticized regarding the distribution and management of equipment, course or training contents and training itself within the scope of the project (Pouezevara, Dincer, Kipp & Sariisik, 2013). In our study, this was seen as a shortcoming of the system that hinders technology use of teachers. However, differently, the importance of observations and evaluations of national projects has been emphasized more in S. Korea (Başak & Ayvacı, 2017).

Internal Force

The current study indicated that most of the participants from each cases agreed that the personal interest of teachers in technology use would enable the adoption and integration of the technology into education. In Finland, the interest that would be shown by the teachers to ICT use was defined as a key factor in the process of instructional technology integration. In the statements of the participants from all three countries involved in this study, it was mentioned that the extent how much the teachers were interested in ICT use could also define their use of it during learning and teaching processes. It was also expressed that the teachers that were more interested in technology would be more willing to build on their knowledge further and they might promote the technology use in class consequently. This finding correlates with the findings of Kim and Jang's (2015) study. Aforementioned S. Korean researchers' findings suggested that when people enjoy using technology, their intrinsic motivation for the use of technology increases directly. Here, intrinsic motivation refers to a source of human action that corresponds to motivation fueled by personal interest, joy and satisfaction formed around the activity itself (Ryan & Deci, 2000). Therefore, we can expect intrinsically motivated teachers to demonstrate their willingness in effectively integrating technology into future teaching activities and to learning more about it. Moreover, the individuals having an intrinsic motivation demonstrate a positive approach against both fun and difficult parts of the task to be done. (Davis & Wiedenbeck, 2001). Similarly, in our study, teachers' interest in ICT seems to depend much more on personal interest and motivation.

Interestingly, only the Finnish participants argued that giving encouragement and providing more time for those who were not interested enough in using technology could increase their interest in the long term. This argument is somewhat similar to that of Myhre's (1998) position (cited in Demetriadis et al., 2003). He explains that the teachers first focus on their interaction with new medium in order to get comfortable with the technology. Then when they have enough familiarity with the technology, they can gradually direct their interest into pedagogical and instructional use of it. But, he highlights that such changes would not happen quickly and are not easily achieved. Consistent support and extensive training would help teachers feel comfortable enough to integrate technology into their teaching practice according to the findings included in Demetriadis et al.'s (2003) study.

As a significant point, a S. Korean participant stated that the teachers' point of view regarding the technology should be changed because it affected the integration process a little in a negative way since teacher-centered education system was dominant in S. Korea. This underlines just how teachers' mindset could have an impact on their ICT use although there were authorities' effort to provide complete physical infrastructure and to increase teacher autonomy in S. Korea. Obviously, the mindset shapes teachers' practice across variety of contexts in terms of their technology use (Tour, 2015). In connection with that, the mindset seem to be formed by teachers' faith in the instructional value of ICT -which has been discussed previously-, their personal interest, favorable technology use experience, pedagogical approach, and knowledge. Thus, as Siddiqui (2008) advocated, teachers should change improve their beliefs about teaching and learning correspondingly if technology is intended to be used effectively to support student collaboration, inquiry and interactive learning (as cited in Oriji & Amadi, 2016), instead of just allowing teachers to reach their teaching objectives without the incorporation of any technology use. In both countries, a possible explanation for these results may be the importance of examinations in education system. The mindset of learning and teaching for exams was considered as a barrier to technology integration in other countries as well (see. Demetriadis et al, 2003). When the aim of the training is to get high scores from the exams, the methods and tools that do not serve this purpose might be eliminated naturally and deliberately during the process.

Additionally, in S. Korea and Turkey, different than Finland, some participants indicated that teachers sometimes tended to see learning something new regarding innovative technologies and teaching with it as a burden due to their lack of interest and unwillingness for making an effort. These teachers were found to be a barrier against technology integration. Especially the Turkish participants listed the following as the reasons for this lack of interest and effort: Teachers' busy private life, heavy workload and their desire to access to information without any effort. Similarly, not only in S. Korea, and Turkey, but in Greece, the findings of Demetriadis et al.'s (2003) study indicated that teachers were reluctant to attend informatics seminar or computer use workshops that were not included in their enforced timetables, as this would be a considerable extra workload for them. The effect of workload had been indicated in many studies as an element affecting teachers' technology incorporation in class (e.g., Jang & Tsai, 2012; Neyland, 2011). Since the incorporation of technology use as an instructional tool is not mentioned in the curriculum specifically, teachers tend to approach it as an additional workload mostly. Consequently, teachers adopt a point of view assuming there is not enough time to prepare a class involving technology use with the right course materials accordingly.

In our study, when participants were asked about their motivation to use technology in the classroom, major part of the participants contributing from Finland states that both students' positive feedback and their self willingness feed their motivation regarding ICT use. Here, the intrinsic motivation of Finnish teachers as well as their student-centered perception are noticeable as an indisputable fact. Likewise, the motivation of Turkish participants was largely fueled by the positive feedbacks of the students. In addition, since it was required for students to learn how to deal with technology as one of the necessities of the time, teachers felt responsible of teaching them. In a similar way, Finnish teachers also felt the need to teach their students how to use technology in consideration of making them more equipped for their future and so they felt more motivated to teach. These findings indicate that the Finnish and Turkish participants in our study were motivated to use technology with a sense of social responsibility (Nelson, 2011). S. Korean teachers expressed the belief that students often use technology in their daily life and they are exposed to technology quite a lot in their everyday life. Thus, S. Korean participants noted the need for teachers to teach the right way of technology use and this requirement motivates them to incorporate technology in their classroom. This motivation source of teachers may be due to ethical problems observed in the use of technology and common digital addiction amongst the students. Surprisingly, none of the participants in our study suggested that they were motivated to use technology because the technology use may enhance students' learning. They only highlighted enhancing the learning experience of the students with the help of technology as one of their reasons of ICT use. Such distinction was needed because of the difference between observations and what the teachers said. Although this was not mentioned, what motivated the teachers for technology use was mostly that it provided convenience (Shin, 2015). Most of the teachers are in the expectation of a physical relief upon technology use reducing the time spent and effort made for the preparation and the management of classes. Most common reasons for technology use of teachers are that it provides convenience and visual attraction and it makes classes much more enjoyable (Baek et al., 2008).

Teacher Autonomy

In each case in our study, professional autonomy of the teachers were acknowledged by the respective participants. The teachers had control and responsibility over their choices and decisions in the process of education including making autonomous decisions about whether or not to use technology for instructional purposes. But, only in Finland, some administrators stated that they trusted their teachers' educational decisions and selection of methods and tools for attaining the instructional goals. Interestingly, the participants from other cases didn't mention such trust. A possible explanation for this might be that while the teacher's role is perceived as a trusted and respected professional by society and educators in Finland (Pollari et al., 2018; Rauhansalo & Kvieska, 2017), the teaching profession perhaps is not respected and trusted in other cases as much as it is in Finland. As an evidence for this argument, it was found that there was a decrease in the encouragement of S. Korean and Turkish parents for their children in becoming a teacher from 2013 to 2018 (Dolton & Marcenaro-Gutierrez, 2013; Dolton, Marcenaro, Vries De & She, 2018). In relation to that, in the countries where the families did not encourage their children to become teachers, children were relatively less respectful against their teachers. Another reason explaining this situation might be the relationship between teacher autonomy and collaboration that is paradoxical. In Finland, teachers possess autonomy to a relatively great extent which contributes teachers' collaboration in enhancing local curricula and help them assess students better. As mentioned in Darling-Hammond's statements (2012), due to the strong autonomy collaboration level that Finnish teachers have, students get the privilege to acquire 21st century skills in highly effective schools. Despite higher authorities' efforts for enhancement of it, not much autonomy is granted for teachers in S. Korea and Turkey only enabling low level of collaboration. While the true reasons to it remain unclear, the situation may be sourcing from the traditional working culture employed. Generally, teachers performed individually and coped with their teaching tasks based on discretion in a traditional manner. On the face of it, mentioned traditional manner became what teachers understood of autonomy (Daling-Hammond, 2012). Therefore, the trending collaborative approach might pave the way for a tension among teachers that are mainly used to a more individual way for some time. Apparently, the autonomy is defined differently in each case.

The training of highly qualified, motivated and autonomous teachers is described as the secret of success in Finnish education. Thus, another possible explanation for this finding is that teacher education and training are believed to produce competent teachers since the education is research-oriented and requires a master's degree (Pollari et al., 2018) unlike in Turkish case. Quality education and popularization of the teacher profession also make the education faculty competitive and as a result only the best students can become teachers. In S. Korea, because of similar reasons, the teaching profession is respected just like in Finland case (see. Dolton et al., 2018). However, according to Global Teacher Status Index survey of 35 countries in 2018 – which included Finland, S. Korea and Turkey too- Finnish participants have faith in their education systems more than participants from other countries (Dolton et al., 2018). These findings are consistent with our findings that teachers are given credit due to high quality education system in Finland.

It is important to note that only in S. Korea and Turkey, discourse on misuse of teacher autonomy was reported. Although the autonomy of teachers offers flexibility in the choices for a variety of situations and needs, some S. Korean and Turkish participants were concerned that some teachers could abuse this flexibility. For instance, teachers may prefer old teaching methods and instructional habits, in turn, they may not prefer to achieve instructional goals with the help of technology. This was a finding of the misuse of autonomy that emerged in our non-Finnish cases. While S. Korean teachers made educational and material choices in the classroom, the finding of Park and Sung's (2013) study showed that their decision-making was related to granted autonomy for the teachers over the curriculum. In fact, this could be because the autonomy they had was less than they perceived, rather than the act of autonomy misuse. Teachers possessed relatively less autonomy in the classroom looking at the predetermined and enforced curriculum and compulsory textbooks published by the government (Park & Sung, 2013). Teachers are responsible of teaching the pre-determined content and conduct the given tests in the national curriculum, thus leaving them little room for the discretion about what to teach. Teachers who are in the effort of fulfilling the requirements of curriculum may not be able to devote time to neither making a lesson plan involving the use of technology nor the use of technology in the classroom. It can be said that the explanations regarding this situation are also valid for the Turkish case. Because there are findings from both this study and another studies indicating that technology use remains very limited or do not exist at all due to an intense curriculum content (Gök & Yıldırım, 2015; Unal & Ozturk, 2012; Yıldırım, 2007). Although technically teachers are given autonomy within the classroom, this may not facilitate technology integration due to obstacles and restrictions during the use of granted authority.

Change in Pedagogical Approach

According to findings of current study, in most participants' discourse, there was a consensus that the pedagogical approach underlying technology use was more important than the use of technology itself. This result may be explained by the idea that the use of technology improves the quality of education only with the help of appropriate teaching and learning pedagogies (Pamuk, 2011; Ra et al., 2016) and obviously teachers are aware of this fact. The selection and implementation of the appropriate pedagogical approach throughout technology integration process is mostly not investigated independent of the teacher's pedagogical beliefs in the literature (Aslan & Zhu, 2018; Ertmer, 2005; Ertmer et al., 2012; Lim & Chai, 2008; Ra et al.,, 2016; Sang et. al, 2010; Shin et. al, 2014). Because, teachers' beliefs are considered a vital indicator of their use of technology in the classroom (Ertmer, 2005). For example, it has been shown that the decisions of teachers based on their pedagogical beliefs have important effects on the effectiveness of teaching and learning in most learning environments, including those that are technology-mediated (Lim & Chai, 2008).

Furthermore, in our study, the data emerged from Turkish and Finnish participant's suggested that the process of technology integration demanded a change in the pedagogical approach. The requirement for a transformational change in the pedagogical approach to technology aided learning at schools was also emphasized with this finding (Ertmer & Ottenbreit-Leftwich, 2013). Teachers' practice of integrating technology in the classroom was typically formed by teacher-centered and/or learner-centered pedagogical approach. As the learning environments that are student-centered reflects crucial amount of potential for the optimization of the capabilities of the learners along with the technology (Hannafin & Land, 1997), a shift from traditional pedagogical practices to constructivist-oriented learner-centered teaching practices may be still critically needed. Similarly, the findings of Ertmer et al.'s (2012) study which examined the alignment among the beliefs and practices of 12 award-winning technology-using teachers showed that the three teachers with the most student-centered beliefs were the ones implementing the most innovative and authentic classroom practices. Therefore, teachers need to understand how they can actually use technology as knowledge construction platforms/tools with the help of a meaningful activity for students.

It is crucial to note that only some of the Turkish participants indicated that the availability of technology didn't always mean the use of technology by the teachers and students in the classroom. They further expressed that nobody knew how much or how effective the available technologies used for instructional purposes were in the context of FATIH project. Although access to technologies is provided, the reasons why these devices are not used may be that the teachers consider technology as something that does not add value to learning, or the lack of pedagogical and technological knowledge of the teachers, or that teachers are still not adapted to the changes brought by technology use in the classroom. As indicated by the evidences included in the Study of Etmer et al. (2012), access to technology alone was not enough to make a change in the teaching practices of the teachers. Maybe if their core beliefs were more in parallel with a student-centered approach, barriers emerging at first would not be effective on preventing the implementation of technology related practices that were student-centered (Ertmer et al., 2012).

The variety of ways are suggested for facilitating the shift/change in the pedagogical approach for technology integration. First of these suggestions based on Offir's (2010) study includes that teachers should receive education in order to be able to make pedagogical decisions in terms of making use of technology in teaching and that they should be granted with autonomy in deciding and/or altering the points related to their own teaching and learning environment (cited in Wengrowicz, 2014). Based on the findings of Lim and Chai (2008), the pre-determined curriculums enforcing the preparation of the students in accordance with the examinations pose a major barrier against the engagement of the teachers with a more constructive teaching approach. As a second suggestion, in order to create a ripple effect on the pedagogical beliefs and teaching practices of the teachers, changing the assessment system might be easier than enforcing them to change beliefs and practices. Our study produced findings for S. Korean and Turkish cases which corroborates the Lim and Chai's (2008) corresponding findings. For example, one S. Korean participant highlighted that even if the teachers had sufficient pedagogical and technological knowledge, they didn't use this knowledge for incorporating technology in classroom. Because teaching with technology did not always help students to solve their exam questions. Similarly, in Turkey the intensive curriculum was required to be fulfilled completely for the exams and teachers had no time to plan a lesson for technology use and actually benefit from it in the classroom.

Thirdly, since the findings of Pamuk et al.'s (2013) and Yıldırım's (2007) studies indicated that after providing technical equipment at the schools, teachers were left behind without further technical, pedagogical and professional support, attention was drawn to the provision of continuous pedagogical support as a requirement of the technology integration process. Because, technological devices do not really require a specific pedagogical approach; rather, each device allows the implementation of a variety of approaches to teaching and learning (Tondeur et al., 2008a).

Importantly, only Finnish participants indicated that they improve their pedagogical practices about the use of technology by collaborating and sharing their ideas/materials/experiences. It is supported by these findings that teachers' collaboration to a higher extent is the main strategy in order to establish improvement in Finland (Darling-Hammond, 2012). Likewise in Finland, the Ministry of Education and Culture put an emphasis on the leading schools since these schools are focusing on interaction and participation by placing the pedagogical leadership at a central point (Lahtero, Lång & Alava, 2017). Obviously, it is necessary to share knowledge to develop a learning-oriented education system; providing this is not an exception in technology-mediated environments. Disappointingly, no signs of similar collaboration or sharing were revealed in order to improve their pedagogical practices in other cases' observations and interviews.

Peer, inquiry and problem-based learning were employed as educational practices in Finland while incorporating technology in classroom. The technology appear to be used for exploration and knowledge construction, communication and problem-solving in Finland (Ertmer et al., 2012). On the other hand, in Turkey, the focus on how to deliver the content via technology was stronger rather than how to make the teaching experience more effective for the students. For S. Korean case, there was no evidence that emerged from interviews accordingly, but observations provided similar evidences to Turkish case. Turkish and S. Korean participants appear to prefer using the technology for direct instructions (Ertmer et al., 2012). As Ra et al. (2016) indicated, the evidence reveals that the quality of education might be improved if appropriate teaching and learning pedagogies are applied along with ICTs use. For example, with the employment of a concept mapping regarding the ICT implementation, self construction of students' structural knowledge can be facilitated by the help of problem-based ICT incorporating pedagogical approaches must be strictly differentiated from traditional counterparts of it in order to make use of the maximum potential that ICT offer (Ra et al., 2016), since the student-centered practices are trendingly considered as the most effective ones in the integration of digital technologies in the classroom (see Ertmer &Ottenbreit-Leftwich, 2010).

Three key factors greatly affecting the digital technology use and make teaching and learning processes differentiate were discussed by Howard and Mozejko (2015): 1) leadership, 2) shared group vision and 3) technical and pedagogical support. As these three factors were discussed earlier in this chapter, they can facilitate educational change regarding technology integration. Therefore, when the change becomes a community activity with the help of school support and participation, the use of technology and change may become meaningful for the teachers. Shin et al. (2014) explain that if the teacher find the technology use valuable, this highly improve their use of technology for instructional purposes, and promote changes in their instructional approach.

The Role of Teacher

The teachers' role in the process of technology use in the classroom was defined differently amongst the countries. For instance, while Finnish participants defined the role of teacher as a facilitator of the learning in the process of educational use of technology, three roles of teachers emerged from the discourses of S. Korean participants: A guide for the students in gaining an understanding of technology ethics, creating tools, and delivering appropriate learning recourses. Interestingly, two divergent and conflicting definition of teacher role emerged from the interviews with Turkish participants: Facilitating their teacher-centered instructional methods with a teacher-dominated approach, and being a guide/role-model.

In Finnish case, teachers' practices were observed and the respective findings showed that Finnish participants defined such teacher role and employed practices from a student-centered approach as Ertmer et al. (2012), which are categorized as follows: Guiding to enable self discovery of the knowledge by the students, acting as a model to promote active learning, being collaborative (sometimes acting like a learner). This also accords with our classroom observations and the rest of the data, which showed that peer, inquiry and problem-based learning were teachers' educational practices while using technology and teachers were open to learn with/from the students. Only a few Turkish teachers claimed that they don't hesitate to learn something new from/with students since they expressed the belief that the students may have better ICT skills than them. This finding may indicate a change in the role of teachers into the only source of information in the classroom. Unfortunately no related evidence for S. Korea was found. This may be because the collected data was more limited and less thick than the other two countries.

In S. Korean case, as discussed before, the importance of teaching ethical issues were predominant as the role of a teacher. In connection with this, teachers should be in capable of teaching his/her pupils to stay safe against contents that could be harmful while wandering around the cyberspace (Kim, 2016). In this context, the provision and creation of appropriate and safe tools and resources were also the role of the teachers in S. Korea. Crucially, based on our observations in the classrooms, S. Korean teachers demonstrated authority and guidance at the same time. However, in S. Korean classrooms, employment of the authority by the teachers regarding technology use in purpose of the establishment of their convenience were apparent (Shin, 2015) similar to observations made in Turkey.

In Turkish context, different than other cases, there is evidence that the teachers undertake a mission to be the sole owner of the knowledge and authority in the classroom within the given freedom by MoE. This is an interesting finding and further supports that although Turkish MoE makes a huge effort to establish a curricula based on the constructivist approach for ten years long, the conception adopted about teaching and learning processes by the teachers do not seem parallel to these efforts (Bas, 2017). Since, the role and responsibilities of teachers are found to be shaped by their teaching approaches (Filiz, Kabaran & Kabaran, 2018; Tezci, 2009), Turkish participants appear to verbalize and demonstrate classroom practices shaped around a teacher-centered understanding (Ertmer et al., 2012) in the current study. Our observations and interviews further support this finding since Turkish participants used technology mostly to present information or sometimes avoid using it due to class management problems.

Technology integration levels in each country appeared to be at different stages, they had different priorities regarding technology use in education, and they practiced different pedagogical approaches. As mentioned before, these findings stated regarding the role of the teachers based on each case might possibly differ from each other because of the following three angles; 1) the absence of a leadership style keeping the change prominent, 2) the lack of establishment of a shared vision and 3) under provision or absence of technical or pedagogical support in order to focus on change (Howard & Mozejko, 2015). It is crucial to comprehend that the characteristics of schools, which are multidimensional, affect teachers' technology use regarding the classroom practices. When there is not sufficient emphasis and support on the change, it could easily give the teachers a signal indicating that the change is not of high priority and also does not possess much value. It is crucial to build a connection between teachers' opinion of what is valuable and the things valued by the school. When ICTs are valued and supported by the other teachers and the management, a teacher also tends to attach more importance to it (Zhao & Frank, 2003). The same is valid for the practices employed and roles adopted based on a student-centered approach. Unless the management appreciates and values this kind of approach, teachers become unlikely to do the same.

Knowledge & Resistance

In the current study, it was a mutual finding that sufficient level of pedagogical and technological knowledge is an enabler for technology integration in each country. These findings are consistent with those of other studies and suggest that the existence of knowledge about how to use technology and understanding of pedagogy associated with technology use effectively are important factors that influenced the utilization of

ICT in the classroom (eg. Mirzajani, Mahmud, Ayub & Wong, 2016; Tezci, 2009). For example, in the study of Park and Son (2009) observing S. Korean teachers, some evidences were shared stating that the lack of knowledge majorly affected the teachers in their decision making processes regarding ICT use. The lack of knowledge about the effective use of technology poses an obstacle against technology integration making an influence on teachers' decision of whether to use technology or not (Ertmer et al, 2012). As mentioned in a research involving the participation of S. Korean teachers, one of them indicated that there exist a lot of teachers trying to integrate technology in classroom practices without the required knowledge and skills to incorporate it systematically in order to help the learning process of the students (Shin, 2015). He also emphasized, as an example, that some teachers only able to project course materials through screens by using PowerPoint presentation tool. This statements, resembling our findings, makes an implication about the dependency of technology integration on the reasons and methods of the teachers' technology use.

Another mutual finding that emerged from each case was that the participants indicated that insufficient technical and pedagogical knowledge might cause teachers to show resistance and prevent them from using technology. In other words, they linked teachers' resistance against technology use to their lack of technological and relevant pedagogical background. This findings aligns with Ertmer et al.'s (2012) findings stating that the strongest barriers that made teachers avoid the technology use were their knowledge and skill level, their approach and beliefs accordingly. In contrast to earlier findings (Jegede, 2009; Mahdi & Al-Dera, 2013; Muslem, A., Yusuf, Y. Q. & Juliana, 2018) regarding different countries, especially in the cases of Finland and Turkey, age factor was highlighted as one of the reasons for teachers' being resistant. Although the results of other studies demonstrate that age didn't make any significant difference among teachers' views or attitudes towards integrating technologies in teaching and learning, this matter was explained by Finnish teachers in relation with incompetency regarding knowledge and experience with technology use since senior teachers had to learn and practice more to catch up with the change.

Interestingly, Turkish participants explained that the forthcoming retirement of elderly teachers might be what underlies behind the reason why they didn't prefer to use and learn about technology. On the other hand in S. Korea, a lack of extra effort was prominent regarding the expansion of the pedagogical technology use knowledge among senior teachers since they mostly believed that they were adequately educated to keep up with their work already. Teachers were observed as showing resistance against changing their teaching practices pedagogically in both Turkish and S. Korean cases. Teachers in Finland only, mentioned a way out to solve this problem through training and collaboration. In addition, one of the S. Korean teachers participating in the current study mentioned the need for a change in the mindsets of the teachers for this resistance to vanish, because the teachers were in opinion that the technology is not easy to use, is a waste of time and not even useful.

Summary of this section

- While Finnish teachers did not use technology integrating it to their teaching due to external forces, Turkish and S. Korean teachers' technology use were mostly enforced by inspections, evaluation policy or a rule brought by a project rather than using it upon their own will.
- In Finnish case, teachers believed that technology use would help them make students good citizens. Teachers' autonomy was recognized and their decisions were respected even though a project regarding ICT integration was in progress at the school. Rather than forcing the teachers to use technology, the leaders were mostly trying to encourage them to use it willingly. Correspondingly, in other two cases, lack of teachers' belief in effectiveness of technology, and provision of no feedback may diminish teachers' desire to use technology, even though there were explicit ICT related curriculum and policy requirements.
- In each case, teachers' personal interests and motivation were found as enablers for adoption and integration of the technology in education.

- In Finnish case, encouragement and providing more time for the ones who didn't have interest and motivation helped them grow interest into pedagogical and instructional use of technology. On the other hand, the change in teachers' mind-set regarding technology integration was found to be essential for effective technology integration in S. Korean case, because their current mind-set was still not very distant from the teacher-centered and exam-oriented learning-teaching approaches, beliefs and values. Instructional methods and strategies which were not suitable for their mind-set could be abandoned hindering the integration process even if the infrastructure was ready and technologies were already available. Evidence of the existence of similar mind-set issues was reported in Turkish case.
- Only in S. Korean and Turkish cases, learning how to use new technologies and designing a course involving the use of these technologies were seen as a burden due to teachers' lack of interest and effort. Heavy workload regarding administrative works and necessity to fulfil the curriculum requirements in a limited time given didn't help them incorporate technology in the classroom as well.
- Social responsibility and students' positive feedback were the motivational reasons of Turkish and Finnish participants included in the study. Interestingly, S. Korean participants were motivated by the necessity they feel in order to teach the right and ethical way of utilizing technology to the students who were heavily exposed to technology in their daily lives.
- In Turkish and S. Korean cases, it was observed that teachers mostly used available technologies for their own convenience. In Finnish case, the teachers made students use technology creating the opportunity for the students to improve their ICT skills.
- In each case, teachers' autonomy over selecting materials and tools, designing the lesson were acknowledged. Only some Finnish administrators pointed out

that teachers were trusted with their decisions with the regarding educational process of the students.

- The lack of collaboration as a part of an interactive working culture, the fact or perception that teaching profession was not respected and trusted much, the lack of trust in the existing education system and of the absence of a good teacher education could be the reasons of experienced trust issues within society in Turkey.
- It was assumed that the autonomy given to the teachers would be used for good purposes in Finland. On the contrary, the autonomy given to the teachers was suspected to be used as ill-intentioned in Turkey and S. Korea. Because the autonomy like a double-edged sword also allows teachers to exclude technology use in the educational process upon their will. However, the reason why some teachers choose not to incorporate technology into classes may be due to intensive curriculum content to be covered in the class, the pressure sourcing from the responsibility felt for the preparation of the students for the exams and limited time granted to do that all rather than the tendency to misuse autonomy that could be given.
- The technology use as a pedagogical instrument was more important than the use of technology itself in each case. Finnish and Turkish participants acknowledged that the technology use as a pedagogical instrument required a transformational change in their pedagogical approach. The pedagogical approach selected for integrating technology was in relation to teachers' pedagogical belief. There was still a need for an improvement in teachers' understanding of how available technology can be used as a knowledge construction tool in a meaningful way designed for students.
- In Turkish case, especially in schools involved in FATIH project, the existence of technology did not necessarily mean that teachers and students used them effectively for teaching and learning. Technology integration process under the

project was criticized for the lack of informative data on how much technology use affects education and how much it was actually used in a desired way.

- Lack of faith in the effect of using technology on education, lack of pedagogical and technical knowledge, inability to adapt to the changes required by the use of technology in education may hinder technology integration process in Turkey even if there are available technologies in the classroom.
- In order to facilitate a positive change in teachers' pedagogical approach, it was highly needed to give technical support, to grant extended autonomy and to establish trainings that will provide teachers with the required vision to be able to make wiser pedagogical decisions. In particular for S. Korean and Turkish cases, a change in the assessment system would provide more room for teachers to incorporate technology in the classroom.
- In Finnish case, the pedagogical knowledge regarding the use of technology was improved by idea, material, and experience sharing and collaboration and. For the other countries, such a case was not reported or observed.
- While in Finland, a student-centered approach was explicit in the pedagogical practices of technology use, in other two cases the technology was mostly used for practices of direct instructional paradigm. The change in pedagogical approach could occur with a strong leadership, a shared vision and continuous technical and pedagogical support.
- While the teacher role was defined as the facilitator in the process of technology use for instructional purposes in Finland, it was defined as teaching ethical use of technology and the provider of materials and tools in S. Korea. In Turkey, the teachers were expected to be a guide, but one that adopts a teacher-dominated approach. With the authority granted, teachers were observed to use technology for their own "convenience" in Turkey and S. Korea.

- In Finland, the student-centered approach was prominent. The teachers were guides, collaborators, and planners of active learning. They utilized peer, inquiry and problem-based learning which had a student-centered focus. Within these learning approaches, students were encouraged to use the technology inside and outside of the school as part of the lesson.
- The Finnish participants were open to learn from/with students. Turkish participants except some of them still thought that they needed to be better than the students at technology to ensure their respect in the classroom. Therefore they held their selves at a distance from trying to learn with/from their students perhaps believing they can hide their competency level if it was lower. No relevant evidence was provided for S. Korea.
- The differences in the teacher role and their approaches may be due to lack of a leadership prioritizing the change, a shared vision and technical or pedagogical support.
- Sufficient level of pedagogical and technological knowledge was found to enable technology integration in each case. This available knowledge would determine the quality of technology integration in each case. The lack of pedagogical and technical knowledge was revealed to cause teachers resist or reject technology use.
- In each case, the age factor was found to have an impact on the resistance that teachers showed to technology use, but the main reasons underneath differed in each case. In Finland elderly teachers were struggling because of the lack of experience with technology and a limited technical knowledge (but they did not quit trying and made an effort tolearn), while in Turkey being close to the retirement age was having a negative impact on the teachers' willingness to learn and make efforts. In S. Korea, teachers didn't want to change the instructional methods they had been using for years and showed resistance to new instructional methods employing recent technology. In Turkey and S. Korea, the teachers apparently had difficulty in accepting the change. The

Finnish participants believed that training and collaboration would help them overcome this issue. The S. Korean participants pointed out the need for a change in teachers' mind-set.

5.1.1.3.5. ICT use & Practices

Our data indicated that in each case, the technologies that participants accessed and utilized vary, and their practices also vary accordingly. This can be explained by the differences in the country's policies and educational objectives, technologies invested in, available infrastructure and school culture/vision. For example, since collaboration and knowledge sharing are the focal point of Finnish education system and their understanding of a productive economy (Kozma, 2008), practices and technologies that serve these purposes were tried to be employed in Finnish schools. Consequently, iPads rather than computers and laptops, cloud technology and Google services rather than fixed and offline technologies, social media tools and specific web-based subject-matter apps were used to promote communication, collaborative work, students' learning process as well as students' creation of knowledge. On the contrary, our findings indicated that social media or communication tools were not used most of the time for educational purposes in Turkey. Similarly, S. Korean participants didn't indicate much about sharing course materials with other teachers or using collaborative tools within the classroom. Regarding the S. Korean case, Park and Sung (2013) states that schools have been places where the teachers feel isolated in a traditional sense. In this aforementioned study, it was revealed that the teachers felt separated from each other. Since the teachers are not able to find time to gather and collaborate due to intense schedules, workloads and accumulating tasks, they get to feel more isolated and individualism emerges. Presumably, a possible explanation for Turkish case regarding collaboration and sharing would be disclosed in a similar way.

Finnish teachers' technology use wasn't limited to only classroom practices, but also they used them for lesson preparations and post-course works. For instance, when they prepare relevant course material, they would share them with other teachers via online and cloud services. Communication with other teachers also would occur with the help of online tools. Once again, it is critical to note that communicative and cooperative working culture were always evident and prominent in Finnish schools (Niemi, 2015), the technology were only facilitating the culture in this context. Finnish teachers appear to be not only consumers of knowledge and content but the producers as well.

In S. Korean case, our findings showed that the teachers mostly used computers and smartphones to consume and present the information and subject-matter contents which were found on the internet. Because of this, presentation tools and multimedia materials were commonly utilized in the classroom. The findings of the current study are consistent with Shin's (2015) findings which showed that the major part of the teachers were using ICT in order to support their teaching practices. Likewise, it was indicated in his study that teachers in S. Korea made use of technology in parallel to purposes such as providing additional course contents, incorporating multimedia contents and for the supply of indirect experiences. A teacher participated in our study mentioned the use of presentation tools as a basic level skill which is already owned by the S. Korean teachers. What these findings indicate might be that the ICT integration is not fully accomplished in terms of teachers' practices and technologies are only used for delivering the course contents (Shin, 2015). As an example, like in the Turkish case, a lot of teachers have used PowerPoint tool instead of using the blackboard for writing purposes. As a result, it may be emphasized that teachers mostly employed technology use in order to provide convenience for themselves instead of employing it to improve the learning process of the pupils (Shin, 2015). There were only a small number of teachers utilizing self-created ICT based contents, featuring the problem based learning through projects in order to provide lessons incorporating quality technology. However, for the Finnish case, the keywords such as peer, inquiry and problem oriented learning were more prominent rather than the other cases. Since some of the teachers participated in this study might have not adopted the idea of ICT integration into education very deeply when compared to other teachers participated, these findings may have emerged as a result.

In Turkish case, the technology use and teachers' relevant practices in a school varied depending on whether this school was involved in FATIH project or not. However, our findings strikingly revealed that the purpose of technology use remained the same, although the technology used has changed in the process of integration. Most of the time, the teachers used projectors or smart boards based on availability for the delivery of digital content, displaying PPTs, and showing videos. This finding is in agreement with Pamuk et al.'s (2013) findings which showed that teachers mostly use technological devices in the class just to project presentations and course materials even though they tend to claim that they are making use of the technologies such as smart boards in order to enrich their teaching practices. Similarly, in our study and in the aforementioned study, the smart board was seen as an internet-connected projector that is just an upgraded version of the old machinery. It may be that these teachers who contributed to the emergence of these findings mostly change their practices and pedagogic beliefs superficially and not fundamentally, thus they did not necessarily use available technologies to establish more interactive and collaborative activities in the classroom. Consequently, teachers' use of technology does not directly convince them to do fundamental changes in their pedagogical practices (Shin et al., 2014), or in their teaching strategies and methods.

Another finding related to technologies used in the classroom in Turkish case is that tablet PCs weren't preferred to be incorporated in the classroom by the teachers due to their lack of connection with other technologies, limited access to applications and being a distraction source more than a learning tool for the students. In accordance with the present findings, previous studies have also demonstrated that tablet PCs are not used in the classroom for instructional purposes (Altın & Kalelioğlu, 2015; Çelik et al., 2017; Gökmen et al., 2018). Similarly, the findings of Çelik et al.'s (2017) and Gökmen et al.'s (2018) study indicated that tablet PCs caused problems in students' attention and classroom management. However, it is highlighted that even if a technical issue or lack of skills seem to hinder technology use of teachers, in fact pedagogical issues are more likely to remain unspoken and undefined reason for it (Çelik et al., 2017; Pamuk et al, 2013).

Our study suggested a relationship amongst teachers' use of technology, provided content and teachers' available time. Likewise, the study of Pamuk et al.'s (2013) also suggest that the provided content along with the technology to be employed with the classroom has an effect on the way teachers and students approach to the technology itself during the teaching and learning processes. Some Finnish and Turkish participants in particular found available content insufficient in terms of amount, diversity and scope, even if the government in corresponding countries had initiatives for providing educational content.

For Turkish case, the present findings seem to be consistent with other research (Gök & Yıldırım, 2015; Gökmen et al, 2018; Keleş, Dündar Öksüz & Bahçekapılı, 2013; Kurt et al, 2013; Pamuk et al, 2013) which revealed that e-content at EBA is lacking both in quantity and quality in general. In S. Korean case, most of the participants did not make any good or bad comments about available course content in regard to technologies to be employed, however the findings of Shin's (2015) study indicated that S. Korean teachers do connect the websites of third-party educational content providers and even pay for these content due to insufficient educational content available, although the S. Korean Ministry of Education provides websites including educational content similar to other cases in our study. The reason why teachers did not use the state-provided websites was that the available course content required to be organized by teachers prior to use during the lessons (Baek et al., 2008). Another reason was that some participants found provided digital testing materials and teaching materials not directly related or exactly parallel to the content that students had to learn for their exams. This again confirms that S. Korean teachers may be still holding on to an exam-oriented mind-set. Our study findings further support this fact since a S. Korean participant crucially highlighted that students' knowledge created with the help of technology use may not help students solve exam questions. Because they can’t transfer this knowledge into actual practice. Therefore, some difficulties of ICT usage for educational purposes perhaps can be experienced around S. Korea where students are educated to succeed in competitive university entrance exams.

It would be expected that teachers would prepare their own content when they found the available ones inadequate or irrelevant. However, this was not the case: Not having available time to prepare relevant course materials was specifically and mutually pointed out in each case. Additionally, while trying to fulfill the strict curriculum requirements, preparing and presenting related course materials and dealing with technical problems that may occur in the classroom were considered as a waste of time. However, interestingly, only S. Korean and Turkish participants highlighted having inadequate time for technology use in the classroom, while Finnish participants only mentioned the long time that was required in order to prepare the course materials initially. It seems possible that these findings are due to differences in understanding, curriculum and examination system amongst participant countries.

Although Finnish teachers were struggling with preparation and learning technology itself time to time, they were somehow still able to prepare course materials and insist on using technology in the classroom. Because they knew that the materials were reusable and it would save time later even if it took some time to prepare and adopt them initially. There are several possible explanations for this result. Firstly, Participants from Finland may have reached to an understanding of that learning something new, adapting to it and starting to appreciate it can take sometime before getting competent about it (Park & Sung, 2013). Secondly, the school culture and the curriculum may strongly reflect teachers’ beliefs, attitudes, and values in Finland due to teachers’ active involvement and participation in decision-making and implementation processes of any strategic and operational policy. Teachers may find it easier to stick with the common decisions and practices since they took part in the decision making processes and feel attached to a shared value, even if it is difficult for them to take it into practice and make it really work. Tondeur et al. (2008) also stated in their study that the technology integration is more likely to be achieved properly when teachers are involved in the relevant policy making and the policies made reflect the understanding, approach and values of the teachers.

On the contrary, in a similar context, according to our findings, S. Korean teachers would most likely give up on technology use and maintain a traditional way of teaching due to intense curriculum enforced studies, school requirements, responsibilities and time management issues. The findings appear in the study of Park and Sung might reveal the reasons to it stating that the major part of the teachers in S. Korea tend to employ a more traditional teaching practice mostly ignoring the curriculum reform suggesting a more student-centered approach. Due to their intense workload, the teachers have little time to reconsider and change the way they teach and this may be the reason why they keep going with the traditional practices. As a result, required changes to be made only remain superficial without a deep implementation touching the fundamental aspects of the practice.

Similar to S. Korean case, Turkish participants didn't want to put further effort on technology use in the classroom because of having inadequate time to spend on thinking about how to teach a topic in any other way, or with different techniques, while having technical problems in the classroom as well as not having enough documents and materials provided. In other studies, teachers saw preparing a lesson involving the use of technology and the materials required as extra workload (Çelik et al., 2017; Kurt et al., 2013). Taking this example into consideration, it is explicit that the capabilities and the tendencies of the teachers are the key elements in order to achieve technology integration in quality regarding the teaching and learning practices (Shin, 2015).

In our study, only Turkish participants clearly demanded the government to provide a pedagogical approach, materials and everything else required for technology integration. In accordance with the present findings for Turkish case, some previous studies demonstrated that teachers did not have enough time to prepare e-content for a specific technology to be used and didn't have enough time to use technology in the classroom accordingly due to an intense curriculum employed (Gök & Yıldırım, 2015; Yıldırım, 2007). Additionally, the findings of Çelik et al.'s (2017) study revealed something different such as the fact that teachers actually found preparing the materials difficult. Therefore, even with the limited time being a problem, the insufficient trainings of the teachers may be the main cause underlying revealed excuses in Turkish case. The shortcomings of teacher education and professional development programs urgently needs to be recognized, since many studies end up concluding their work by stressing the need for a more adequate and improved training programs for teachers in Turkey (e.g., Aslan & Zhu, 2018; Çalışkan, 2017; Ekşi & Yeşilyurt, 2018; Gök & Yıldırım, 2015; Pamuk et al., 2013).

Different than other two cases taking part in the study, S. Korean participants pointed out the necessity of having up-to-date materials and provision of safe and ethical content. The necessity of making ethical and security testing of the teaching applications and contents was emphasized. For the sake of these intentions, the development of special programs that could be used in the schools was suggested instead of using commercial applications. Through out the study, ethical concerns of S. Korean teachers was a feature that distinguishes S. Korean case from the others. There was a huge emphasis on ethics education not only related to technology use but in general too. There is one likely cause for the differences amongst the cases regarding ethics education and teachers' ethical concerns: The foundation of the education system. Shin and Koh (2005) explain that Confucian principles and ethical values play a significant role in S. Korean education system. Moreover, ethics education has been included in the national curriculum of S. Korea since 1945 (Moon, 1995). Therefore, ethics education has relatively longer past and its facts had deeper roots within the S. Korean society. Although ethical problems may be different nowadays due to internet and shared platforms, the essence remains the same. Additionally, S. Korean government is aware of problems arising from the digital world. With the help of government-imposed policies not only in education field but also in industry, they put effort to create desirable ethics consciousness for the informatization society (KERIS, 2015). In the case of Finland, doing so means to teach self-regulation skills. Unfortunately, in our study, no findings regarding the importance of ethical education was emerged. However, the participants mentioned some behaviors of students referring them as unethical use of ICT, but did not mention anything about prevention strategies. Indeed, Turkey have policies, objectives and associations that concerns ethical use of ICT. For example, one of the aim of the Information Technologies course at middle school level is facilitating students' effective and productive use of ICT in an ethically correct way. Consequently, concerns and actions regarding the ethical issues seemed not to be distinguished in Turkey as much as it was in S. Korea.

In Turkey, similar to S. Korea, the participants indicated that they mostly used the internet for information search and reaching out to contents. But, internet censorship and content restrictions because of the national education and government regulations appear to hinder the process of technology use in the classroom. The evidence we found points to the participants' complaints about this situation because they couldn't reach the necessary videos and materials on the provided technologies at any time they needed in the classroom as reported by Gökmen et al. (2018). Since they found downloading videos and preparing the materials difficult in their free time and outside of school, content restrictions on the internet didn't help them to use technology. As previously discussed, they already found digital content and materials provided by the government insufficient, both the inadequate provision of e-content and the limitations against the internet content must be making the situation worse in terms of the idea of freedom of access to information. Although it may be thought that the restrictions may have been made in order to provide a safer internet usage experience and promote access to good and appropriate contents and resources, in Turkish case, this actually led to the emergence of unwanted behavior of students. For instance, some participants pointed out that the students managed to change the settings of the tablet PCs and the smart boards. By breaching the security measures, the students intend to reach the content and applications that are restricted in the first place in order to keep them safe from the harmful contents that they may confront. This was also proposed in some other studies (e.g., Pamuk et al., 2013; Yolcu & Bayram, 2016).

Summary of this Section

- Teachers' ICT use practices varied in each case. The available technologies purchased to serve the realization of country's policies, educational objectives, and school vision determined their use. Once again, the understanding of collaboration and knowledge sharing among teachers and students concluded their technology choices and purposes of its use in Finland. Technology as a tool appeared to be a facilitator of their collaborative culture.
- Therefore, they mostly utilized iPad, Apple TV, social media tools and apps, cloud technologies and Google services as well as projectors and laptops. On the contrary, even if interactive technologies were available in S. Korea and Turkey, they mostly used them for the purpose of content presentation and enhancing visualization. Thus, presentation tools and multimedia materials were most commonly used technologies in their classrooms as well as TV screens in S. Korea and projectors/smart boards in Turkey.
- In Turkey, even if the type of technology varied, the purpose of their use did not. For example, projectors and smart boards were mostly used for presenting content and multimedia. Superficial change that came with technology use in their pedagogical practices and in their teaching were observed.
- Tablet PCs were not used by teachers and students as it was intended to be due to technical and pedagogical issues.
- In S. Korean and Turkish cases, the teachers mostly incorporate technology to assist their teaching activities. In other words, they used them to ease their responsibilities as an educator instead of focusing on improving students' learning experience. This could be an indication of a relatively low level of ICT integration.

- In S. Korea, teachers assumed to have enough ICT skills, but they were defined as only having basic level of ICT competencies like presentation skills.
- In Turkey and S. Korea, social media and communication tools weren't popular amongst teachers. The isolation and individual work of teachers were explained their busy schedules, heavy course loads and additional duties to be handled within a limited time period.
- In Finnish case, available technologies also helped teachers' lesson preparation and their post-course work.
- Digital content availability and teachers' available time were revealed to be two important determinants of teachers' ICT use in the classroom in each case. Interestingly, in Finland and Turkey, the available digital content were criticized to be poor in terms of amount, diversity and scope, although there were available digital content platforms supported by the government.
- In Turkey, EBA was found to provide incompatible and insufficient content for high school level. It could be better for elementary school level but they didn't have adequate technology to get benefits of online platforms.
- In S. Korea, even though the participants didn't provide any evidence regarding online platforms and content, previous studies showed that S. Korean teachers connected to third-party online content providers since the digital content on government websites was not sufficient. Additionally, they thought that available course materials didn't meet exact curricular requirements for the exams and the students could not transfer their knowledge created with the help of technology use into solving exam questions. Therefore, teachers didn't need to utilize technology.
- In each case, finding available time for the preparation of digital materials was an issue. However, the Finnish teachers put an effort to prepare content and material for the technology use even if it took long time. They were aware that the digital learning materials are reusable once they are prepared and they can help teachers to save time later on.

- Being aware of that they may face difficulties in the process of technology integration and feeling a sense of ownership of school policies and rules related to technology integration due to active involvement in decision-making process may help Finnish teachers not to give up on trying to incorporate technology in the classroom.
- On the contrary, S. Korean and Turkish teachers tended to consume and present ready-to-use course materials which were already available on the internet, because they claimed that they didn't have available time for the preparation of the digital materials due to the strict curriculum requirements and time management issues.
- Some research conducted in Turkey revealed that teachers indeed considered the material preparation as a difficult task. Thus, the underlying issue could be the lack of teacher education and professional development.
- In particular for S. Korean case, the teachers' busy workload and their responsibility of doing school administrative works were criticized for not leaving enough time for S. Korean teachers to rethink about their pedagogical approach in order to integrate technology effectively in the literature. Therefore they find themselves slipped into their old habits in teaching rather than finding a way to change them.
- Only in Turkish case, the government was seen as the provider of everything needed for technology integration. This was crucial, because it may indicate that teachers may not be aware of their role in the process of technology integration.
- In S. Korea, teaching ethics in technology use were prominent. In Finland, they prevented emergence of the ethical problems by teaching self-regulation skills to the students. However, in Turkey, perhaps due to the lack of given importance to ethics and lack of teacher guidance, unethical use of ICT was common among the students.

- Only in Turkish case, internet censorship and content restrictions were reported to hinder technology use in the classrooms and caused the emergence of unwanted behavior of students.

5.2. Conclusion and Recommendations

While there are many studies pointing out the problems faced by stakeholders in the ICT integration process including FATIH project in Turkey, there are few that suggest specific solutions and recommendations by covering many different aspects at the same time. Similarly, in comparative studies conducted between Turkey-Finland (e.g., Geriş, Kulaksız & Kelleci, 2016), Turkey-S. Korea (e.g., Başak & Ayvacı, 2017; Geriş et al., 2016) and recently Turkey-Singapore (e.g., Çetin & Solmaz, 2017), generally, policies, statistical data and the documents of educational institutions are examined. Although similar findings to ours are revealed in those studies, adoption of a perspective demonstrating the whole picture in a pure qualitative manner by comparing 3 different cases is not prominent.

According to comparisons that are made across selected countries in previous section, ongoing shortcomings and aspects that need to be improved are spotted in order to enhance technology integration process in Turkey. Based on the findings and discussions, the following recommendations are offered for the stakeholders at different levels. These recommendations are shared through a viewpoint that values what can be learned from the practices implemented in other observed countries and how to adapt them into the Turkish educational system. Some conclusions are also stated in each recommendation part.

5.2.1. Recommendations for Policy Makers

From a multi-level ecological perspective, the decisions related to policy implementation are made. For the lower levels, policies of ICT integration and guidelines of it are structured and shared at the macro level. The degree of decentralization/autonomy, the degree of joint decision-making practices, testing policies, the scope of the curriculum, finding alternative ways of access to technology, and ethical and moral issues in the use and regulation of technology determine the implementation of ICT policies.

Enhancing Local Autonomy- Providing flexibility and room for local decision making are one of the distinctive features in Finland and S. Korea. Improving local autonomy in Turkey may facilitate a successful process of technology integration in education:

- Rather than moving to a completely decentralized form of governance like Finland, local governments/institutions may be given the responsibility to make more decisions like S. Korea. This approach may provide quick response to the problems that arise at school level and facilitate schools to make decisions that are appropriate to their needs in the process of integration.
- School management committee can be established and their freedom in decision making can be encouraged as in S. Korea in order to make implementations less centralized.
- There exist some policies resembling the structure of an umbrella metaphorically; based on these policies, proper strategies, means of implementation and details accordingly can be determined at the city and school level. It is possible to establish strategic plans at school level and school curriculum taking the national policies and national curriculum into consideration. Likewise, a school management committee can be established in Turkey in order to develop the strategies pertinent to the circumstances in the schools and then make the planning in accordance with it.
- In order to eliminate the uncertainties associated with the use of ICT in the curriculum, strategic plans at the school level and the preparation of school curricula can be encouraged.
- The central power of the state should be reduced by increasing the power of local authorities, but this requires, as in Finland, to rely on the creativity of the

school teachers and their ability to transform and adapt the curriculum. Therefore, first of all, efforts should be made to ensure that Turkish teachers achieve a quality standard and an awareness level similar to teachers have in Finland and S. Korea.

Sharing responsibility- The whole task of integration process can be carried out not by the responsibility of a single state body, but by the cooperation of more than one institution, and the participation of key stakeholders. Hence, a more feasible and effective integration process can be realized in Turkey. Following recommendations are made to empower responsibility sharing:

- The responsibility of Directorate General of Innovation and Educational Technologies (YEGITEK) should be distributed to other institutions/ directorates in order to improve the quality of the implementation and to facilitate monitoring just like in S. Korea.
- In terms of structure, the MEST, KERIS, MPOEs trio are actively involved in every step of the implementation in S. Korea. In this way even if governments and systems change, long-term studies and projects continue (Başak & Ayvacı, 2017). Therefore, other governmental organizations such as KERIS should be established and involved in the process in Turkey as well in order to maintain ICT project's continuity and to determine problems in implementation process.
- YEGITEK should focus only on several aspects of technology integration process instead of dealing with the realization of all the components of FATIH project. This would be possible with sharing the responsibility of educational planning, coordination, implementation, evaluation and research amongst other institutions and local authorities.

Improving joint decision-making- Taking joint decisions with participation of stakeholders may ease the process of integration. It may also allow those responsible ones to feel ownership of their actions instead of practicing government-imposed sanctions superficially. Following recommendations are proposed to improve joint decision making process within technology integration process in Turkey:

- In order to end up with a deep impact, national and local policies and planned actions should be taken into consideration and coordinated together with all the parties involved (Buza & Mula, 2017). Considering all participants that have a role in the ICT integration, a joint plan should be made and support and trainings should be provided accordingly. Attitudes and beliefs of all parties should be valued and cared about in order to keep them coordinated.
- Lack of involvement in the process of policy setting appeared to widen the gap between theory and practice, and policy makers' and practitioners' understanding of integration. Thus, not just top-down implementation approach but also bottom-up one should be taken into consideration by Turkish MoNE as it was in Finland.
- MoNE can be encouraged to take the specific requirements of the parties included in the technology integration process into consideration by the bottom-up approach for implementation and also the involvement of the practitioners in decision making process.
- In order to prevent practitioners from not fully accepting policies, the policies should reflect teachers' educational value, technology competencies and attitudes towards technology use. This may be possible with promoting joint-decision making about the goals of projects and their implementations. Continuous in-school assessments and project evaluation regarding the use of technology and its effects should be done. The results and feedbacks should be shared with teachers and corresponding institutions for their self-improvement.

A need for change in testing policies- The subject matter knowledge learned through ICT perhaps does not provide help in solving the questions on the paper-based exams according to teachers. There are uncertainties in the assessment of how the use of available technologies within the scope of the project affect student achievement in Turkey. Thus a change made in testing policies may facilitate the integration process:

- As it is tried to be done in Finland, college exams can be digitized and students can be assured of the existence of certain computer use qualifications. This may prevent teachers to abandon technology use in the classroom.
- At high school level, teaching intensive content in the curriculum within a limited time given didn't leave any room for activities that engaged students in using technology for their own learning. Again there might be a need to review the intensive content in curriculum.

Promoting alternative ways for overcoming financial obstacles- FATIH project appeared to introduce inequality amongst schools in terms of available technologies and the opportunities due to the provision of unevenly distributed budget and infrastructure. There is a problem in planning and allocated budget for ICT integration in the schools in general. Therefore, in schools where the project is not implemented, the development of alternative ways of access to technology and their use should be supported instead of suspending the process of integration. In this regard, the practices of Finland can be taken into consideration as an example:

- The schools with insufficient budget should not wait for only FATIH project to be implemented in their schools, but the government and institutions should encourage leaders and practitioners to work on alternative ways to access resources just like Finnish participants did based on their needs and environments: technology procurement through international and local projects, using shared technology provided by MoNE at city level, leasing the devices, the adoption of Bring Your Own Device (BYOD) concept, inviting the educator to the school instead of going to another location.
- The schools where FATIH project was not implemented spent their budget to improve the physical conditions of the school. In fact, the need for access to

high-level technology in schools is not a priority, but the elimination of the school's physical deficiencies is. After the elimination of physical needs, technologies should be provided at the simplest level in the classroom; such as projectors, laptops. Although S. Korea was a pioneer country in terms of high-end technology, public schools did not generally have more than a TV screen and a computer embedded in the teacher's desk. Success in education, therefore, may not come only with the provision of high-level technology. Related Turkish institutions should not ignore this point either.

- Leadership qualifications of administrators should be reconsidered in order to prioritize ICT integration in the schools since the budget was spent according to the primary needs of the school decided by the management. Even if there is a need for improving physical conditions of the school, an awareness that prioritizes keeping at least the existing technologies in working condition should be one of the qualifications of the principals. MoNE should designate administrators as technology leaders by considering the requirements and goals of technology integration process.
- As S. Korea and Finland do, Turkey should also be spending more money on research and cooperative studies. Of course, not just in Turkey but also in other countries, tecno-centric policies and projects that become influential on a large scale enable the access to technology at the school level, but problems in subjects such as planning, management and effective budget allocation affect the success of these large-scale projects. With more preliminary research, it is possible to make projects and studies based on research data, and to bring the desired results and outputs by making use of the budgets to be spent for the implementation phase.
- Unlike Turkey, within S. Korea's techno-centric policy applications, the importance of R&D, planning and evaluation was emphasized with the impact and help of institutional power. Similarly, in the process of Finland's technology integration, advanced and constructive feedback systems in the field of process evaluation and data collection are available at local and

institutional levels. Therefore, it is vital that the progress of applications made in Turkey in the area of technology integration is based on regular research data. Making the decision to change or terminate the projects according to the results of the research may help to overcome the financial problems as soon as possible.

Improving accessibility to technology and support- As in other countries, lack of access to technology and lack of technical and pedagogical support could be a barrier to the use of technology in the classroom in Turkey too. After the provision of the devices, continuous technical and pedagogical support are required to ensure continuity in the use of technology both by the teachers and students. The recommendations regarding the facilitation of technology integration by providing access to technology and continuous support are given below:

- The schools within and outside of FATIH project have different technical problems and support issues. Especially the schools outside of FATIH project struggle with accessing to any technology if PSA couldn't provide much budget via donations. Currently available technologies and computer laboratories in those schools should be updated instead of keeping them idle for a certain period of time.
- The schools within FATIH project had issues regarding slow running, unstable, censored internet and incompatible operating systems on different devices. Providing fast and unrestricted internet and solving this incompatibility problem may eliminate the excuse for teachers' inability to use technology initially.
- Unplanned infrastructure establishment and impractical placement of equipment were infrastructure related problems in Turkey. The inability to be effective and to keep a standard in implementation and supervision of the projects at any managerial position seemed to be the source of the problems although there existed long and short term implementation plans. This problem

can be solved by expanding the jurisdictions of local institutions, as there may be a lack of communication between the workers and the upper institutions.

- Getting help from an outsourced contractor was a mutual practice in each country. While, the schools in Finland and S. Korea were receiving assistance from various private and state sector service providers, Turkish schools could receive help depending on the availability of the IT teachers, the school budget, or the terms of the warranty. In every country, it was possible to have a delay in responding to the technical problems. As in some schools in Finland and S. Korea, to employ a professional technical staff within the school who will do maintenance of the facilities and equipment in order to keep them running properly may prevent delays in response to the technical problems occurring at the schools in Turkey.
- In Turkey, the existing technology was outdated at the schools where the FATIH project was not applied. Leasing the devices may be the solution to this problem just like it was in Finland or the necessary technological tools and maintenance and repair of these tools can be provided through the project.
- The question remains whether troubleshooting and technical maintenance trainings should be given only to ICT teachers or those are the trainings that every subject teacher must receive. This issue should be considered in detail perhaps.

Improving Ethic and Moral Issues regarding technology use- Unlike Turkey, the importance of these issues as a component of technology integration has come to the fore in Finland and S. Korea. The reason is not due to a lack of regulations in Turkey, because related regulations are already available. However, this issue may be emerging due to a lack of awareness of the teachers on the subject or it could be because the subject is not regarded as a priority compared to other problems. The following recommendations may help to eliminate this problem:

- In S. Korea, teaching ethics in technology use was one of the teachers' role. Teachers cared a lot about teaching ethical and safe use of technology. Awareness increasing studies conducted both in the state and the private sectors and since the state attaches importance to ethics issue for many years, state's approach had an impact on the formation of this situation in S. Korea. In order to create a similar situation in Turkey, awareness-raising trainings and studies in the private and state sectors should be conducted. Within the scope of professional development courses that could be offered specific to teachers, it can be tried to establish a culture of ethical technology use by raising awareness.
- Just like in Finland, In Turkey, gaining students self-regulation skills can be added to the objectives of the curriculum and students' ethical and safe use of technology can be supported this way. In addition, instead of introducing restrictions on internet access and providing limited functionality on tablet PCs, a culture of ethical technology use may be generalized by making students obtain these skills.
- It is highly required to establish some institutions and organizations specific to educational fields in order to ensure a secure internet, to enable the use of education information services, and to provide protection against external hacking attempts. Thus, security at the state level would be ensured in education field as in Finland and S. Korea.

Providing quality content- Although there are available digital content platforms supported by the government, the amount, diversity and scope of the available digital content in Turkey are found inappropriate and insufficient. The absence of content addressing the needs of teachers and students and the lack of time for teachers to prepare the required content constitute an obstacle to technology integration. The following recommendations are provided to help overcome these barriers:

- When teachers were not provided with quality content that they could use in their classes, they could often entirely abandon the use of technology instead of preparing the contents on their own. Therefore, the availability of quality content is of great importance for technology integration. Contents should be prepared by taking feedback from teachers.
- Intensive curriculum requirements and time management issues are shown as the reasons of teachers' unwillingness to prepare content. In addition to these, due to the lack of technical and pedagogical knowledge and skills, they may have difficulties in preparing a lesson plan by including materials and technology and they may be avoiding. These problems should also be solved.
- Teachers' efforts to prepare content can be rewarded.
- It should be ensured that teachers get the awareness that once the contents are prepared, they are reusable and it will save time for the later use although preparation takes much time at first. At this point, co-workers' help and collaborative work habits can play a role in gaining awareness.

5.2.2. Recommendations for Administrators and Practitioners

Since principals are the leaders of their schools, their strong educational and ICT leadership characteristics, and positive perspectives on the use of technology in education may can facilitate progress of the technology integration. In addition to their leadership characteristics, their priorities may also determine whether the allocated budget would be spent to meet the requirements for using technology or not. Competencies like strategic acting and having a visionary approach were hardly found among school leaders in Turkey based on studied schools. Thus, improvement in ICT leadership of administrators deserves special attention. Additionally, effort on decentralization and improvement in ICT knowledge and competencies of administrators may also help technology integration at school level.

Developing ICT leadership - The principals, in particular, and vice principals are perceived as ICT leaders in the schools in each country. Principals' priorities at management level, their perspectives on technology, and the type of leadership they have adopted can provide explanatory information about the decisions taken at school level regarding ICT integration process, teachers' use of technology and whether the school has a progressive technology integration process.

Managers in schools that were not included to FATIH project in Turkey, did not consider themselves responsible for technology integration as much as their counterparts did in Finnish schools. In S. Korea and Turkey, unless teachers are willing themselves or unless they are enforced by the upper institutions, these leaders did not actively participate in the process of technology integration. In Turkey, especially within the schools out of FATIH Project's scope, priorities or the personal opinions of the school principals could be effective in a negative way in the process of technology purchase and use. The following recommendations can provide school leaders take an active role in the process of integration of technology in Turkey:

- Educational leaders should act more strongly and be committed to supporting technology integration in terms of fulfilling the objectives of integration. Therefore, it would be the best practice possible to employ and appoint the people as leaders that are dedicated, motivated and most likely to feel satisfied by the contribution they would make regarding the students’ learning process at all levels (The World Bank, 2005). The roles and responsibilities of these educational leaders regarding ICT integration should be clearly specified and valued within educational programs and they should be supported by both of their superiors and peers. This way, they can play their part in the creation of a culture of innovation and they become able to encourage the teaching and learning processes for the pupils regarding ICT use.
- A bottom-up approach should be favored instead of a top-down approach in order to encourage the establishment of a community of practice. Leaders

emerge naturally from among the people that are respected in the group (Barab, Scott, Del Valle & Fang, 2012). Therefore, the formation of a community would be encouraged in this manner and a sense of need would be felt naturally by the whole group instead of creating a perception enforced by the management among individuals.

- In Turkey, since the school principals did not value technology use much, it was viewed as one of the reasons that teachers did not use it extensively. Leaders in Turkey are required to reach a certain level of awareness, such as the Finnish counterparts. The leadership criteria of the teachers chosen as managers should be reviewed and necessary trainings should be given to gain the desired leadership characteristics.
- In the past years, ICT qualification certificates were required in S. Korea to become head teachers or managers. These certifications, which constitute a precondition for promotion, were used as an incentive. Teachers and teachers to be managers should be encouraged to develop ICT competencies more seriously like in S. Korea.
- As another way, school managers may be held responsible for finding the necessary budget for building technology integration through the creation of projects or participation in projects such as in Finland. In this way, the managers will have to make an effort for the development of their schools without the need for voluntary action. These projects related to ICT integration can be supported primarily at the state level as in Finland.
- In Finland, the reason for that the leadership qualifications are considered to be important and that the decisions taken by the leaders are respected may be the practice of shared decision making. Hence the importance of leaders in schools in Turkey may be due to the culture of obedience imposed hierarchical structure. Instead, leaders should be more of a part of the school culture, feel like one of the teachers and the leaders and become a role model indeed. This

may also be possible with a consultative leadership style adopted by managers, as in Finland.

Developing forces for effective community capacity building- The role of building the capacity of the school community is attributed to the principals in three categories: Generating a shared vision, supporting a shared ICT leadership and enabling professional learning. In Turkey, some shortcomings in the practice of these three categories were found and a requirement for the development emerged. The following recommendations may be useful in providing this development to make technology integration more effective:

- In fulfilling the duties, it was more about the individual rather than collective movement. Both leaders and government officials have an important role to play in creating shared vision and collaborating in this direction. First of all, the state needs to support the shared vision concept with written documents: such as the strategic plans ensuring the follow-up of a certain path / frame at national, city and school level as in Finland. The creation of city and school level strategies by practitioners in accordance with national strategies can also lead to a collaborative movement departing from individuality. The collaborative community can effectively share the responsibility of the necessary tasks under a strong school leadership and raise awareness among all partners about the place of technology in education.
- Whether or not the FATIH project was being implemented, the visions of the schools could be determined in accordance with the personality traits and personal interests of the principals of these schools. If the FATIH project was in practice, it was implemented with a superficial vision shaped around the project. A true shared vision was not really observed in schools. Dominance of an authoritarian leadership style in the schools don’t help the creation of neither a shared vision nor a strong leadership. Decision-making mechanisms

must function in a participatory manner so that practitioners may feel belong and committed to the policies and decisions they implement.

- The technology integration process was merely considered as an extra work to be done. There may be a lack of awareness of both the leaders and teachers in understanding the value that the technology adds to education. Therefore, in order to create a shared vision and shared leadership, all the educators must first develop a similar level of awareness. Communication and feedback mechanisms between policy makers, managers, leaders and practitioners at all levels should be improved.
- There was no effort at local level to provide professional learning opportunities for teachers. First of all, there were obstacles arising from the mobility limitation of the leaders at the school level as the necessity of a centralized administration model: the operations such as opening a course, calling external professionals etc. required a lot of permits and paperwork. It was necessary to do the applications directly to the central administration, sometimes when these applications were missed, teachers could not get the access to the courses. For these reasons, expanding responsibilities at the local level can help overcome these problems. Secondly, teachers might not be allowed access to these professional development courses by the management due to concerns that there will no teacher available to have the classes with the students. The existence of financial problems may be preventing to have substitute teachers to compensate for the teachers that would attend the professional development courses, but these problems can be overcome by the arrangements that can be made with the school hours and the spare time of the teachers. This may be possible through strong leadership characteristics and increasing school-level mobility.

Creating a culture of knowledge sharing- The presence of an organizational learning concept is not detected in Turkey. In relation to that, the knowledge creating or the exchange of knowledge amongst the teachers in a formal or an informal way is not a common practice. In particular, creating and sharing ICT materials and exchanging the know-how about educational use of technology are not promoted or practiced very often. The lack of a culture of knowledge generation and sharing can make technology integration difficult. Therefore, the following recommendations may help improve this situation:

- In order to increase teacher cooperation to have a successful technology integration, first of all, it is necessary to provide a school environment where sharing and knowledge creation can be performed. For this, the curriculum with excessive content is needed to be relieved. The paper work requirements brought by the hierarchical structure both among the institutions and regarding the school works should be reduced.
- If teachers are prone to individual learning and study because of their personal characteristics, such as in S. Korea, they should be provided with a variety of rich online cooperative work platforms and professional development courses by the government, similar to the practices in S. Korea, and should be encouraged to use these platforms and to attend these courses by the school administration.
- Community of practice is not a prominent concept in Turkey, while it is in Finland. The emergence of this concept may be related to strategic plans, the existence of a separate curriculum at school level, the existence of shared vision and the ability to act together and make decisions at a collective level. These said elements are not available in Turkey; individuality is more in the foreground. This problem can be overcome by the leadership of visionary leaders after the construction of strong strategies and plans by the central government.
    - Group meetings and discussion sessions held at the schools, conferences and meetings for all teachers need to be promoted and supported.

    - The practice of the colleague based ICT tutoring, creating projects that supports a learning community within the city schools can also be helpful for the emergence of the community of practice.
- If Turkish teachers don't have the will and awareness to do informal knowledge exchange practices as in Finland, The S. Korean practice of "open-class" observations can take as an administrative requirement in order to create a force to promote and encourage the sharing.
- Monthly meetings held among teachers of the same subject in Turkey were not really a leading platform for knowledge generation and knowledge share in purpose of ICT integration. Only teachers in certain branches (e.g., Math) shared their ideas and experiences with ICT. There was no meeting or gathering involving teachers of other subjects and the ICT teacher. At school level, such meetings may be encouraged.
- Isolation of teachers might originate from intense workload, busy schedules and extra tasks to complete that are required to be handled in a limited time. Reasons for having a more isolated environment rather than a culture of co-operation should be eliminated in order to develop a cooperative work culture.

Adopting a holistic approach in practice to develop students ICT skills- In Turkey, there is FATIH project intended to promote the use of technology in education and in addition to it, there are independent ICT courses offered at the secondary education level. In theory, the project and the curriculum include the objectives related to the use of technology in education process of both students and teachers of every subject. Although there is a holistic approach to the development of student ICT skills in theory, a more isolated approach is followed in practice. The following recommendations were made in order to ensure that the determined approaches are not only remain in theory but can be transferred in practice too:

- Each and every teacher, instead of only computer teachers, should be responsible for teaching ICT skills at the each level of schools. The acquisition of ICT competences should not be seen as an isolated learning objective. It should be the responsibility of the teacher from every subject to make sure that all student gets the benefit of proper ICT use.

- Teaching technology use should not be the only purpose of the classes that is defined in the curriculum. The objectives of the courses should cover the teaching of the ways technology work instead of the ways of using it.
- The absence of participatory and joint decisions made among the partners, the lack of understanding of policies, curricula, and projects lead to a difference among the roles, responsibilities and understanding of implementation of policy-makers, leaders and teachers in the ICT integration process. Again, setting a common vision and standard can eliminate the complexity and unclearness regarding the roles, responsibilities and understandings of partners in the process of developing students' ICT skills.
- Since the ICT teachers and teachers of alike subjects are available at schools, other teachers and the students tend to be less aware of their responsibilities regarding the development of ICT skills. The answer to every technical problem should not be a computer teacher. If it will be like that, there should be an increase in number of ICT teachers available and more definitive expressions should be included in their job descriptions stating their responsibilities at the school level.
- Being able to form school-level curricula in Finland was allowing them to open extra ICT courses according to student requests and needs. The scope and implementation of these courses were limited to the knowledge and skills of the teachers who were available and willing. Similarly, in Turkey, for students to develop their ICT competencies in different areas, the focus should not be only on the ICT teachers but other teachers should get involved in this process too.
- Since ICT teachers were more interested in the tasks related to FATIH project rather than the ICT skills development of the students and since the other

teachers were in opinion that the high school students were capable of developing ICT skills on their own, it seemed like bringing these skills to the highest level was not the top priority in high schools. Teachers may not be totally aware of the value that should be attached to the effective technology use in education and how a successful ICT integration process should be realized. To overcome these kind of problems, the vitality of the technology integration process must first be understood by policy-makers and leaders and then it must be reflected to the educators responsible for the implementation.

- Teachers have the perception that student ICT use skills are better than their own. This belief eliminates the need for further enhancement of ICT competencies of the students, or it is thought that students can develop their own skills at the high school level. However, it is not clear whether these skills are used for educational purposes. Students should be provided with self-regulation skills to ensure that they are able to perform their own learning and use technology in their educational process, as in Finland. Or, as in S. Korea, teaching ethical use of technology may help too.

Developing ways of coping with students' misuse of technology- There are ICT qualifications that students use in their daily life for entertainment purposes. In fact, the technical competence of using technological tools is seen to be superior to that of teachers. The problem, however, is that these qualifications are neither used in the classroom nor at home for educational and training purposes. The following recommendations were made in order to deal with the problems such as using social media and making activities that are not relevant during the course, computer game addiction and not following ethics and moral rules of technology use:

- In order to overcome risk factors in internet use, teachers may help students learn self-regulation over the technology use. As Finnish participants suggested, providing enough freedom to use technology and teachers' active mediation would help student to learn self-regulation.

- Students did not view devices such as computers, tablets and cell phones as tools that could be used for educational purposes. They were able to download unauthorized applications and games by changing the restrictive settings of tools and breaking their codes. First of all, teachers and parents should help students to realize that technology may actually facilitate their learning. Restrictions neither make students obey the rules nor use the technology for educational purposes. So, instead of restrictive mediation strategies, active mediation strategies should be adopted by teachers, parents and leaders.
- In order to cope with ethical and moral technology use problems, firstly this issue should be given importance by the upper institutions as in S. Korea. It will not be sufficient just including it merely as a course to the curriculum. ICT education should be a part of daily life. Conferences and trainings not only covering students but also teachers and parents should be provided on this subject.
- Teachers should be role models for students. First of all, teachers themselves should develop self-control and ethical technology use habits.

Improving teachers' motivation to use technology- Inspections, evaluation policy or a rule brought by a project lead Turkish teachers to use technology in the classroom rather than their own willingness. An explicit ICT related curriculum and policy requirements can facilitate technology integration however, technology integration with the help of this external power can only go up to a point. Since teachers' personal interests and motivation are enablers for adoption and integration of the technology in education, every possible way should be discovered in order to foster interest of the teachers and keep them motivated along the way. Some of these ways are presented as recommendations below:

- Training of the teachers are required in order to enable them to deal with the complexity that comes along with the technology integration process and they should develop the required skills to adapt to the change, innovation and sometimes uncertainty.

- Teachers should be encouraged to change their mind-set about technology use. The teacher-centered and exam-oriented learning-teaching approaches, beliefs and values should shift to student-centered and constructive learning-teaching approaches evidently. This change could be possible with necessary arrangements in policy and curriculum, emphasizing how technology helps them specifically, peer/co-workers' help, encouraging teachers to attend trainings by approving teachers' leave, offering continuous support and quality trainings, ensuring that the technology works and it is accessible.
- Rather than forcing the teachers to use technology, the leaders should encourage them to use upon their own will. For this, teachers' belief in effectiveness of technology should be built up first. Providing constant feedback about ongoing projects, teachers' educational technology use and their impact as well as related students' success may prevent teachers from diminishing their enthusiasm for technology use.
- An environment where teachers will not perceive technology use as a burden should be created. There is no time left to use technology when trying to perform curriculum requirements in limited time. First of all, the curriculum should be reviewed and necessary arrangements should be made. Teachers experience problems with both time constraints and lack of knowledge before preparing a lesson plan aspiring the use of technology. In this case, it is also very important to offer continuous support and quality trainings, to have peer/co-workers' help, establishing collaboration and create a working environment where knowledge share culture is embraced.
- Teachers' autonomy should be recognized and their decisions regarding technology use in education should be respected even though there is an ongoing ICT related project at the school level. However in Turkey, there were some concerns that teachers would not be using the given autonomy in the

desired direction. In other words, teachers sometimes tended not to benefit from any technology when choosing their educational tools. This may be due to lack of pedagogical knowledge or lack of ICT skills, and also lack of access to technology, intensive curriculum content, pressure to prepare for exams, and lack of time. Because these reasons are not independent from each other, all of them need to be improved together.

Requirement of a change in pedagogical approach- In order to use the technology effectively in the education process, there is a need for a significant change in the pedagogical approach of teachers since teachers' pedagogical belief determine the technology use as a pedagogical instrument. In Turkey, accessibility of technology in scope of FATIH project did not ensure that the teachers would use of these technologies as a knowledge construction tool in a meaningful activity for students. Recommendations on how to achieve this change are presented below:

- Fist of all, a strong leadership, a shared vision and a continuous technical and pedagogical support should be available for a shift from practices of direct instruction paradigm to a more student-centered practices in Turkey.
- To facilitate a change in teachers' pedagogical approach, there is still a need for an improvement in teachers' understanding of how available technology can be used as a pedagogical instrument. In this regard, trainings for a more knowledgeable pedagogical decisions should be provided, since the lack of pedagogical and technical knowledge may cause difficulties in adapting to the changes required by the use of technology in education.
- Collaboration amongst teachers and sharing of the ideas, materials, and experiences regarding the pedagogical use of technology should be encouraged.
- The teachers' belief in positive effect of using technology on education should be strengthened by providing research data and feedback in order to encourage teachers to use technology in a desired way. The research data, results and

process analyzes of the applications and projects aiming to disseminate the use of ICT should be shared with the implementers of these projects.

- An increase in technology incorporation in classes may be fostered by changing the assessment system saving more time and space for teachers' additional applications. Instead of just rushing the classes to cover all the topics defined in curriculum and spend the allocated time for preparing activities related to the exams, teachers may actually invest their time on developing new strategies about how they can incorporate technology in the classroom.
- The role of the teacher should also change in order to realize this transformation. In Turkey, it could not be ruled out that the role of teachers in the technology use process should be a guide but even in that guiding, a teacher-dominated approach was prominent. In order to make a student-centered approach dominant regarding the use of technology, the teachers should guide, collaborate, and plan the active learning. They should also enforce a method fostering peer learning that is mostly problem-oriented and favors inquiry. Pupils needs to be supported to make use of technology for educational purposes everywhere.
- Teachers should change their belief that they are the only source of information. They should leave behind the idea that they have to know everything about the use of technology so they do not disgrace their selves before the students. Because lack of knowledge and skills can cause teachers to develop reluctance or rejection against the use of technology. They need to be open to the idea of learning from/with students and also to the self development anytime it is possible.
- In Turkey, it was observed that especially teachers that are elderly and close to retirement experience difficulties in accepting the change. Extensive training and collaboration would help them to overcome this issue.
- Although the available technological tools changed over time, the intended use of the tools remained the same. And there is only a superficial change in

pedagogical practices regarding technology use. In order not to leave this change superficial, policies, practices and transitions should be in parallel with teachers' beliefs, skills and educational understandings.

- Teachers should be included in decision-making processes by referring to their needs and requests too. In this way, teachers can feel as a part of the change instead of opposing the change and they can actually make an effort for the integration.

Promoting collaboration between school community and parents- Another aspect that enables technology integration is the participation of families in the process. Parents' affirmative or negative attitude towards technology use, the level of ICT competencies and knowledge of parents, financial status of families are in some way related to the process of effective technology integration and technology use habits of the students. Parents' attitude, knowledge and parental guidance are the primary issues to be addressed in Turkey. In families, there is the idea that technology courses are not as important as other lessons. Many families have the false perception that their children are already technology literate, which does not reflect the reality indeed. Regarding the use of technology at home, parents displayed a prohibitive approach and poor communication skills in terms of parent-child relationship. These mentioned problems are not facilitating the process of technology integration. The following recommendations may be considered to improve the situation for families:

- In order to solve parent-related issues, the leaders should meet with the parents on a regular basis and try to raise their awareness about technology integration process and relevant projects. The parents should also be included in decision-making stages of technology integration process to some extent. In this way, the parents may understand their responsibilities in the process of technology integration.
- As done in S. Korea, projects and policies including both families and students can be developed to increase the awareness level. Because the students gain

ICT qualifications and skills not only at school but they can also gain them at home with the right approach of the family. Family can support their children to learn the educational use of technology at home and contribute to the effective use of technology in education. Therefore, families should have the skills to provide effective guidance, to be a role-model, rule-making and effective communication at the same time.

- For families to value the use of technology in education and especially their positive beliefs about the necessity of technology courses can support the integration process. As in S. Korea, having open-class observations led teachers to prepare classes using technology. The proper and in point requests of families can somehow positively affect teachers' decisions about whether or not to use technology in classrooms.
- Children need to have enough knowledge and awareness firstly in order to make the right use of technology for their children and for what purposes they use technology. For families to develop a true understanding of the purposes that their children are using the technology for, they should be conscious and have knowledge about technology to a good extent first.

5.2.3. Recommendations for Teacher Educators

Improving teacher education and their practice- The courses given in the faculties of education of universities are insufficient for the development of teacher candidates' use of ICT in education. This insufficiency was found not only in faculties that train any branch teacher but also in faculties that train computer teachers. The familiarity of newly recruited teachers with the use of technology could have been greater than those of teachers working for many years, but this did not mean that they used ICT more effectively and efficiently in their classes. Recommendations for developing teacher training are as follows:

- In the process of technology adaption, increasing the learning quality is not something that the teachers, especially the more experienced ones, lay emphasis on much. By believing in its necessity and the value that it will add to the education, all teachers should integrate technology use in their educational processes at all levels with a conscious approach. Programs provided for the teacher education must be somehow challenging, so that the teacher candidates are kept aware of the fact that technology use improves the learning and instructional processes beside its use for demonstration purposes (Baek et al., 2008).
- The curriculum employed within the teacher education programs should carry the objective of developing teacher candidates' ICT skills while enhancing their capacities and potential to enable a much better ICT integration.
- Since it will be effective on the ICT integration, the motivation of the pre-service teachers should be enhanced accordingly by making the required effort.
- The absence of a strong emphasis on the ICT education of pre-service teachers indicate that they mostly have to learn how to use technology and use it in their teaching after they start their professional life (Admiraal et al., 2017). This problem can also be solved by paying more attention to ICT use for instructional purposes with the supply of more inclusive teacher education programs. Educators providing service at teacher education faculties should put emphasis on pedagogical and ICT related knowledge regarding content arrangement along with the featuring of more opportunities and modelling (Wetzel, Buss, Foulger & Lindsey, 2014).
- A policy concerning course content and ICT competencies should be established at the level of teacher education faculties of every university to ensure the uniformity.
- Instead of increasing the number of teacher education faculties, the main objective should be increasing the quality of it. Only in this way the gap between what is learned in universities and what is needed to be implemented

in the classrooms after being a teacher can be reduced, especially for computer teachers.

- When teachers' education is considered, to adopt a more holistic and integrated approach as in Finland will be logical. This adoption will also mean a trend that is considering teachers as developers actively contributing to the entire school community (Niemi, 2015). Prior to their graduation as professionals, teacher candidates receive an education that is mostly research-oriented. This is how they gain the ability to establish projects that can both contribute to school's and their own development.
- The educational decisions of the teachers should be credible as they are in Finland. For this, there is a need for quality teachers who can be trusted by their decisions of course. Only as in S. Korea and Finland, a proper student selection process for education faculties and a good teacher education can produce high quality teachers. It is necessary to increase the living standards of the teaching profession, to make it a desired line of business, so that the quality of the students coming to the faculties can increase.

Improving quality of professional development trainings- Some issues regarding the level and content of the trainings are identified in Turkey. Most of the time, the level of the courses are kept basic, and the content doesn't offer usable practices adaptable to real life cases. If the courses were not compulsory, the teachers did not prefer to participate very much. School's effort to provide extra trainings at local level wasn't appreciated by the teachers. The teachers are not willing to devote their time to these courses due to the difficulty in the applicability and inadequate scope of given information in the courses. Moreover, due to the idea that it was not really required to teach the students a high level of ICT competence, the teachers did not consider themselves responsible for developing their corresponding skills. Both the quality of the courses and the awareness of teachers about their own learning should be increased in order to increase the willingness of teachers to participate in the courses and the applicability of the knowledge learned in the courses. The following recommendations can help to do so:

- In order to improve the quality of the courses, a need must be arose for these courses. Teachers should attend courses by believing that these courses will be useful. Therefore, first of all, the content of professional development courses should be rearranged according to the needs of teachers. Teachers' requests should also taken into consideration in the process of creating course content. In addition, a dynamic structure needs to be adopted because needs change frequently.
- FATIH project also includes the introduction of many courses as one of its components. However, this is mostly limited to defining how many teachers should be provided by how many hours of these courses. Teachers think that these courses do not help in real-life applications. Quality control mechanisms are not available. Like in Finland, teachers' professional learning and school development can be supervised and evaluated by local providers. The scope of in-service courses can be determined by the urban institutions of Ministry of National Education and school community.
- As in Finland, expenses may be covered through projects without only waiting for the help of the state in order to provide high-quality courses, and experts in relevant fields may be invited to give small-scale urban school-level conferences. Thus, training can be taken at the required level and scope.
- As in S. Korea, teacher development can be supported by developing many online quality content and providing access to them for teachers. In this way, a more need-driven approach will be accomplished.
- The overload of given tasks, intense curriculum and teachers' pedagogical beliefs seem to hinder their ICT related professional improvement. Teachers may not give importance to their own development because they think that they have sufficient ICT competence, they are mostly in a rush to prepare course contents in limited time and they have doubts about the value of

technology in education. When these problems get resolved, teachers will tend to take extra trainings not because they feel obligated but they are actually willing to do so. In order to eliminate these obstacles, the importance of technology integration should not be remained so-called but it should be highlighted also in practice by policy makers and school leaders. Joint decision making, effective feedback and research-based implementation mechanisms should be established. Most importantly, there should exist a concept of shared vision in real terms.

    - In addition to in-service trainings, teachers should be supplied with professional development courses teaching the collaborative approach, teamwork and networking in work environment in order to promote a much qualified pedagogical understanding.

- It was one of the main problems that the courses given within the scope of FATIH project could not be taken by the teachers in the schools that had not yet participated in the scope of this project, and that there was no environment to implement what would be learned even if these courses were taken. This problem brings the difference of ICT skills between teachers. In schools where the infrastructure is incomplete, teachers do not feel the need to receive any ICT training. In the schools not included to the project, teachers can be encouraged to develop the ICT qualifications by providing them with a simple level of equipment (eg. A projector and a computer per a class).
- The excuses introduced by teachers against not to use technology are interpreted in relation to the lack of knowledge of teachers regarding the use of technology as a pedagogical tool. Thus, a high level of quality should be provided in professional development trainings and their content by the upper institutions. Until then, teachers' relations with technology and their attitudes towards technology use should not be expected to develop.

Improving the pedagogical knowledge of the teachers- In Turkey, the teachers were using technology to help them realize their course objectives effectively, as different than the other countries. However, the qualifications of organizing an effective educational environment for all students with the help of ICT were particularly different from their counterparts in Finland. Teachers preferred to use technology for their own convenience, for the diversification of the way of delivering the content and enhancing the visualization of the content. However, technology must be used in order to do teaching activities on a regular basis and should not be employed only as a complementary teaching tool. There existed teachers that had very low level of ICT adoption.

Especially in high schools, there existed a technology use in practice that was teacher dominant and the objective of use was mostly about preparing the students for the exams. It was unfortunate that reasons stated for technology use in other participant countries such as increasing the motivation of the students towards the lesson, facilitating collaboration and communication could not be included within the research results in Turkey. This may be caused by the lack of pedagogical knowledge of teachers on the use of technology. Increasing the motivation of the students towards the lesson, facilitating collaboration and communication causes symptoms such as by participants from other countries should not have to emerge in Turkey was unfortunate. This may lead to the lack of pedagogical knowledge of teachers on the use of technology. As pedagogical knowledge is accepted as one of the indicators that determine the quality of teachers (Guerriero, n.d), improving the quality of teachers will ensure the effective use of not only technology but also of many other tools. In order to improve teacher quality, the pedagogical knowledge of the teacher should be increased. Some recommendations that can be realized to improve the quality of teachers in Turkey are listed below:

- Within the scope of the FATIH project, teachers were not granting sufficient amount of opportunities for the pupils to use technology in the classroom by suggesting technical and classroom management problems as excuses. There was a more teacher-focused technology used in classrooms. On the other hand, in schools outside the scope of the FATIH project, as there were a single computer or projector available, teachers were using these tools to facilitate only their teaching experience. In both cases, there may be a lack of knowledge of pedagogical use of technology in education. Improvement of this pedagogical knowledge will be possible through high quality professional development training and cooperative work. Providing trainings on finding solutions to current problems of teachers and how technology should be used in education in practice can attract teachers' attention to these courses.

- Teachers tended to design the classes problem solving oriented in order to educate students in purpose of succeeding at the university entrance examination and they used technology accordingly. Projecting the questions onto the board or displaying them via smart boards was defined as the technology use. In this way of use, student interaction with technology or learning with the help of it is not actually enabled. Teachers were already in opinion that the knowledge learned with technology does not actually help students to be able to solve more questions in the actual exams. In this case, the regulation of the examination system first can help teachers to change their point of view. It can be stimulated that teachers save more time for interactive technology use in the classroom, and teachers will have more reasons to improve themselves accordingly.

Supporting a change in status of the computer teacher department – It is stated that, in Turkey, the newly graduated teachers of any subject do not mostly have the required competencies regarding ICT use. In addition, it is also stated that there are differences between what the newly graduated computer teachers learn in the university and what they need to teach at school in terms of content and the use of competences gained. Besides, it is observed that the availability of computer teachers at the school may lead other teachers to avoid taking the responsibility of making pupils gain ICT skills. Changing the status of the computer department may facilitate reaching desired level of teachers’ ICT use in the classroom:

- Just as in Finland, the subject of ICT can be made a department that the teacher candidates from any department can do as a minor instead of training the teacher candidates to be a specialized ICT teacher. This way, the teachers who are interested in this field can also specialize in it and the possibility of finding ICT leaders in schools can be increased.
- Instead of training specialized ICT teachers, the department of computer teacher can be structured under the faculty education and the focus could be kept at developing the ICT skills of the teachers from all other subjects. That way, a step could be taken in the way of giving the responsibility of teaching ICT skills to all pupils to all teachers.

5.2.4. Recommendations for Researchers

During the research process conducted in Turkey, Finland and S. Korea, some contradictions emerged between data collected over interviews, observations and written documents regarding the technology integration. Participants used some contradictory expressions during the interviews. Further research can be made on the causes of these contradictions. These contradictory situations are summarized below.

- Participants in S. Korea said that since all students and teachers were considered as they already had sufficient ICT qualifications, the technology integration was not highlighted as much as before by the policymakers or school management. In addition, since everyone was exposed to technology enough outside of school, there was no need for much use in the school environment. On the other hand, it was criticized that the ICT proficiency level of teachers did not go beyond basic presentation skills, and students did not use their competencies for educational purposes. A high level of technology integration or high-level technology availability in S. Korean schools was not observed. Teachers were only expected to have very basic ICT proficiency in the exams held prior to their appointment as a teacher. There may be differences between teachers' perception of their ICT competencies, the skills teachers actually need to use in the classroom, and the level of proficiency that policy-makers expect from teachers. This can be investigated in more detail.

- In S. Korea, the use of technology did not go beyond being a replaceable educational tool. It was observed that the classes were not designed in a way where teaching with the help of technology use is a keystone and an integral part of the educational activities. They usually bragged about the existence of a good infrastructure. This may be due to the high accessibility of the Internet and any intermediary device countrywide. Each school and class visited had a computer and TV screen without any exception. However, a high level of technology integration could not be observed. It can be investigated that how does the over exposure to the use of technology in daily life affects the technology use of students and teachers in the classroom.
- In every case, it was stated that student ICT skills were superior to those of teachers. Teachers also stated that they learned a couple of things from students or other teachers. On the other hand, it is stated that student ICT skills are inadequate for educational purposes. Not enough data were collected to be able to define these competencies that were stated as both superior and unsatisfactory. A more detailed study can be done to find out what are teachers' understandings and expectations about the ICT competence of the students.

Summary of the Recommendations

Summary of the recommendations are presented in Table 5.1 below:

Table 5.1. *Recommendations*

	Recommendations
Policy Makers	• Enhancing Local Autonomy • Sharing responsibility • Improving joint decision-making • Promoting alternative ways for overcoming financial obstacles
Administrators and Practitioners	• Developing ICT leadership • Developing forces for effective community capacity building • Creating a culture of knowledge sharing • Adopting a holistic approach in practice to develop students ICT skills • Improving teachers' motivation to use technology • Requirement of a change in pedagogical approach • Promoting collaboration between school community and parents
Teacher Educators	• Improving teacher education and their practice • Improving quality of professional development trainings • Improving the pedagogical knowledge of the teachers • Supporting a change in status of the computer teacher department
Researchers	• There may be differences between teachers' perception of their ICT competencies, the skills teachers actually need to use in the classroom, and the level of proficiency that policy-makers expect from teachers. This can be investigated in more detail. • It can be investigated that how does the over exposure to the use of technology in daily life affects the technology use of students and teachers in the classroom. • A more detailed study can be done to find out what are teachers' understandings and expectations about the ICT competence of the students.

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APPENDICES

A. LIST OF POSSIBLE TURKISH PUBLIC SCHOOLS FOR DATA COLLECTION

[Veri Toplanması Planlanan MEB Okullarının Listesi]:

1- Çankaya - Pakize Erdoğu İlköğretim Okulu
2- Çankaya- Reşatbey İlköğretim Okulu
3- Çankaya- Sokullu Mehmet Paşa İlköğretim Okulu
4- Keçiören- Subayevleri Mehmet Akif İlköğretim Okulu
5- Sincan İl Genel Meclisi ilköğretim Okulu
6- Etimesgut İstiklal İlköğretim Okulu
7- Çankaya-Ülkü Akın İlköğretim Okulu
8- Yenimahalle- Necdet Seçkinöz İlköğretim Okulu
9- Yenimahalle- Konutkent İlköğretim Okulu
10- Altındağ- Satıkadın Ortaokulu
11- Çankaya- İzzet Latif Aras Ortaokulu
12- Çankaya- Ayten Tekışık Ortaokulu
13- Keçiören Atatürk Ortaokulu
14- Yenimahalle- Yahyalar Duralı Bezci Ortaokulu
15- Çankaya-Talat Paşa Ortaokulu
16- Sincan İl Genel Meclisi Ortaokulu
17- Çankaya- Halide Edip Adıvar Ortaokulu
18- Altındağ-Ankara Anadolu Lisesi
19- Eryaman Anadolu Lisesi
20- Yenimahalle Mehmet Akif Ersoy Lisesi
21- Çankaya- Ümitköy Anadolu Lisesi
22- Yenimahalle-Gazi Anadolu Lisesi
23- Keçiören Rauf Denktaş Lisesi
24- Çankaya- Dr. Binnaz Ege - Dr. Rıdvan Ege Anadolu Lisesi

B. TEACHER INTERVIEW SCHEDULE IN ENGLISH AND KOREAN

[Teacher Interview Schedul - 교사 인터뷰 일정]

Research Title: 연구 제목:

Comparison between Turkey, Finland and South Korea Cases: Integration of Educational ICT (정보 통신 기술) Use at Classroom Level

터키, 핀란드, 한국 사례의 비교 : 교육 ICT 통합이 교실에 수준 사용

Dear Participant, 친애하는 참가자분들:

I am Filiz Cicek, a visiting researcher at Philosophical Faculty at University of Eastern Finland and I am a doctoral candidate at Computer Education and Instructional Technologies Department, Middle East Technical University, Ankara – Turkey. I am conducting my dissertation on ICT use in from 1nd to 12th grades classrooms at schools.

저는 Filiz Cicek 라고 합니다, 동부 핀란드 대학, 철학 학부 연구원이며 터키 앙카라 중동 기술 대학 컴퓨터 교육 및 학습 기술학과에서 박사 과정을 읽고 있습니다 .저는 저의 ICT 에 관한 논문을 1 학년부터 12 학년 교실에 사용 실시하고있습니다.

Thank you agreeing to participate and taking your time to talk about your insights and perspective on this issue. For your privacy, please note the following below:

참여에 동의하시고 시간을 내여 인터뷰 문제에 대해 당신의 통찰력과 관점에 대해 이야기해주셔서 감사합니다. 귀하의 개인 정보는 아래의 사항에 유의하시기 바랍니다

1) This interview session will be audio-taped and the recorded audio will be held with high confidentiality.본 인터뷰 세션은 오디오 녹화되며 녹음 된 오디오는 높은 기밀성으로 개최됩니다

2) Only my adviser and committee members of my dissertation will have access to recording.오직 저의 논문연구의 고문 및 위원만이오디오기록에 접근할수 있습니다

3) You may choose to stop the interview any time you want.

당신은 언제든지 인터뷰를 중지할수 있습니다

If you have any further questions about the study or the interview, please let me know.

만약 당신은 연구 또는 면접에 대하여 다른 문의 사항이있을 경우 알려 주시기 바랍니다

Date: 날짜:__________________

Start Time: 시작시간._____________

Descriptive Information 기술적인 정보

i. Teachers' individual background (gender, teaching experience, professional development)

교사 개인 배경 (성별, 교육 경험, 전문적인 개발)

1. Age 나이:
2. Gender 성별:
3. Highest degree graduated with 최고 학위 졸업:

4. Subject area 전공 영력:
5. Teaching grade level 교육 학년 수준:
6. Do you have any administrative duties of the school?당신은 학교에 행정 업무가 있습니까?
7. Have you taken use of ICT in Education-related training (ICT skill training, ICT integration into curriculum training…)?당신은 교육 관련 훈련에 ICT 의 사용하려고 고려 했습니까?(ICT 기술 교육,교과과정훈련에 대한 ICT 통합....)?

Organizational level issues 조직수준의 문제

ii. Organizational norms (policies, curriculum, in-service professional development, teacher education system)
조직규범 (정책, 교과 과정, 서비스 전문 개발, 교사 교육 시스템)

8. What do you think about national level policies on the use of UCT in education? 당신은 교육 UCT 의 사용에 대한 국가 차원의 정책에 대해 어떻게 생각하십니까?
9. What do you think about school level policies on the use of UCT in education? 당신은 교육 UCT 의 사용에 대한 학교 차원의 정책에 대해 어떻게 생각하십니까?
10. How do you implement the policies into your classroom activities? 당신은 어떻게 반급 활동 정책을 구현합겠습니까?

11. How do you describe the relationships between ICT use in education and teaching/learning process?

당신은 어떻게 ICT 사용이 교육과 교수 , 학습 과정에서의 관계를 설명하겠습니까?

12. What kind of in-service professional development courses are provided for you on ICT?

당신을 위해 제공되는 ICT 는 어떤 종류의 서비스 전문 개발 과정이라고 생각합니까?

12.1. How do these courses change your ICT use in education?

이 과정은 교육에서 ICT 사용을 어떻게 변경한다고 생각합니까?

13. How do you think that teacher education in your country support teachers' ICT use in education?

당신은 자신의 나라에서는 교사의 교육에 교사의 ICT 사용을 지지하는것에 대하여 어떻게 생각합니까?

School Level Issues 학교 수준 문제.

iii. Socio-organizational factors (school culture, administrative issues, school infrastructure) 사회 조직 요인 (학교 문화, 관리 문제, 학교 하부 구조)

14. How can you describe your school's technology infrastructure? (hardware, software, internet connection, quality of tools, service, financial support, administrative support)

당신의 학교의 기술 하부구조를 어떻게 설명하겠습니까? (하드웨어, 소프트웨어, 인터넷 연결, 도구의 품질, 서비스, 재정 지원, 행정 지원)

15. How should be necessary school-level infrastructure to support ICT s in education?

교육의 ICT 을 지원하기 위해 학교 수준의 하부 구조는 어떻게 필요하다고 생각합니까?

16. Is there a plan or vision for use of ICT in your school (teaching & learning, infrastructure, professional development, etc.)? If there is any, what are they?

학교에서 ICT 의 사용을 위한 계획이나 비전이 있습니까?(교육 및 학습, 전문적인 개발 을 학습 등) 만약 있다면 그들은 무었입니까?

16.1. How do teachers in your school try new ways to enhance teaching &learning activities with the help of ICT s?

학교에서 교사들은 ICT 의 도움으로 어떻게 교육 및 학습 활동을 강화하는 새로운 방법을 시도합니까?

16.2. Do the teachers collaborate with other teachers to enhance the use of ICT in teaching environment?

교사는 교육 환경에서 ICT 의 사용을 향상시키기 위해 다른 교사들과 공동 작업을합니까?

16.3. If they do how do they collaborate?

만약 하였다면 그들은 어떤공동 작업을 하였습니까?

17. What is the role of school management in terms of supporting ICT use in education?

교육 지원 ICT 사용의 관점에서 학교 관리의 역할은 무엇입니까?

18. How do administrators support you to use ICT s in the classroom?

관리자는 교실에서 ICT 을 사용을 어떻게 지원합니까?

18.1. How do administrators support your ideas related to ICT use in education?

관리자는 교육에서 ICT 사용과 관련된 아이디어를 어떻게 지원합니까?

18.2. Do you think that administrators give value on ICT use in education? Why do you think so?

당신은 관리자가 교육의 ICT 사용에 가치를 부여한다고 생각하십니까? 왜 그렇게 생각하십니까?

18.3. Do you think that there is pressure on you to use ICT s in education? Why/ not?

당신은 교육에서 ICT 을 사용하는 방법에 대한 압박이 있다고 생각하십니까? 왜서요? 없다고 생각하십니까?

19. Who teaches core ICT subjects/skills to children?

누가 아이들에게 핵심 ICT 과목 / 기술을 가르칩니까?

20. Do you have a subject matter teacher on ICT in your school?

당신의 학교에는 ICT 에 대한 주제 교사가 있습니까?

21. Who maintains the technical infrastructure (network, computer, labs…) in your school?

학교에서 기술 하부구조(네트워크, 컴퓨터, 실험실 ...)를 유지하는 분은 누구십니까?

Classroom Level Issues 교실수준 문제

iv. Classroom settings 교실 설치

22. How would you define ICT use in education?

교육에 ICT 사용을 어떻게 정의 헐것입니까?

23. What kind of ICT tools do you utilize to facilitate teaching and learning activities in the classroom?

어떤 종류의 ICT 도구를 교실에서 교육과 학습 활동을 촉진하기 위해 사용합니까?

24. How do you use these tools in your classroom?

당신의 교실에서 이러한 도구를 어떻게 사용합니까?

24.1. How do you decide which technological tools will be used for educational purposes?

당신은 교육 목적으로 사용되는 기술적 도구를 어떻게 결정하겠습니까?

25. What is the main reason that you use ICT in your classroom?

당신의 교실에서 ICT 를 사용하는 주요 이유는 무엇입니까?

26. How do you feel motivated to use ICT s at the classroom?

교실에서 ICT 을 사용하는 동기는 무엇이라고 생각하세요?

27. How do students' ability to use ICTs effects your ICT use at the classroom?

교실에서 학생들이 ICT 효과사용하는 능력 어떻다고 생각합니까?

28. What are the barriers for integrating ICT into education in your lessons?

수업에서 교육에 ICT 를 통합하기위한 장벽은 무엇입니까 ?

29. What are the enablers for integrating ICT into education in your lessons?

수업에서 교육에 ICT 를 통합하기위한 블러는 무엇입니까?

30. What do you think about advantages of ICT use in education in general?

일반적으로 교육에 사용되는 ICT 의 장점은 무엇이라고 생각합니까?

31. What do you think about disadvantages of ICT use in education in general?

일반적으로 교육에 사용되는 ICT 의 단점은 무엇이라고 생각합니까?

32. What is the role of a teacher while utilizing ICT s?

ICT 을 활용하면서 교사의 역할은 무엇입니까?

33. Do you want to add anything else related to ICT use which you think that it is important?

당신은 당신이 중요하다고 생각하는 ICT 사용과 관련된 다른 의견을 추가하시겠습니까?

C .INFORMAL DIRECT OBSERVATION SHEET

General Info	Date Time Teacher’s Name Subject Topic Grade Number of Students	
Technical Info	What are the types of technology available in the classroom?	
Pedagogical Info	How is technology used in classroom?	
	Activities Interaction Technology Use of Teacher Technology Use of Students	

Ahn

14. April. 2015

(1) ~~Ahn~~ Young Seok

1x45

Math Teacher

14:10 – 14:55

Konu: Çarpanlara ayırma

3. grade – middle school. (27 student)

4 students low level

sits seperatly.

4-5 student lower level

(1) projection

(2) Speakers

(3) Wi-fi.

Teacher distrupute books.

He gave extra work sheets

(4) Teacher has tablet, and connecting + projection

Asking questions with the help of reflection of presentation.

He is solving questions on tablet → student can see it on the reflection

* Students can use their (5) phones for lesson-related things.

* Teacher asked them a question and students searched the answer on the internet

* Naver (6) search...

* Teacher gave his tablet to a student who didn't have phone * → cevapını aratırdılar

* Teacher gave an example from chemistry as well

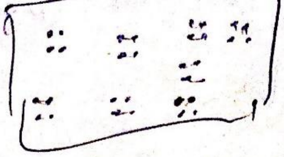
H_2O } çarpanlara ayırma
2.2.5.

* They use internet for dictionary.

* Prime numbers ⟺ Korean → English

* He leads students — tableti kullanıyor
— tablet kalemi
— öğrenciler can see what teacher pointing out on reflection

*~~A~~fter that students try to solve the problem as groups (4 students) → It is ~~sitting~~ seat system.



→ 4'lü gruplar şeklinde oturuyorlar

*Hoca tek tek herkese yardım ediyor
Tablette soruyu çözüyor

*Hoca ~~yapanlardan birinin~~ taskların hepsini yapanlardan birisinin worksheetinin fotoğrafını çekti ve yansıttı. Bu şekilde öğrenciler yanıtlarını kontrol edebiliyor

*Tableti hoca birine veriyor ve üzerinde işlem yapmasına izin veriyor

— 8 — Ders başında–sonunda selam veriyorlar

*Bu hoca text-book yazıyor. (soft-copy)

Lack of classes teachers Students are mixed	So they are not using books really.

D. EXAMPLES OF PERMISSIONS REQUIRED TO PERFORM THE RESEARCH

ÖĞRENCİ İŞLERİ DAİRE BAŞKANLIĞI
REGISTRAR'S OFFICE

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
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03.03.2015

EĞİTİM FAKÜLTESİ DEKANLIĞINA

Ankara Valiliği Milli Eğitim Müdürlüğü'nden alınan, Bilgisayar ve Öğretim Teknolojileri Eğitimi Ana Bilim Dalı Doktora Programı öğrencisi Filiz Çiçek'e ait yazı ilgisi nedeni ile ilişikte sunulmuştur.

Bilgilerinize arz ederim.

Saygılarımla.

Nesrin Ünsal
Öğrenci İşleri Daire Başkanı

SSD/

6/3 / 6/3 6/3 E.Ç.

ÖĞRENCİ İŞLERİ
DAİRESİ BAŞKANLIĞI
Ev. ... Md. ...

T.C.
ANKARA VALİLİĞİ
Milli Eğitim Müdürlüğü

Sayı : 14588481/605.99/2074757 — 25/02/2015
Konu: Araştırma izni

ORTA DOĞU TEKNİK ÜNİVERSİTESİNE
(Öğrenci İşleri Daire Başkanlığı)

İlgi: a) MEB Yenilik ve Eğitim Teknolojileri Genel Müdürlüğünün 2012/13 nolu Genelgesi.
b) 04/02/2015 tarihli ve 1515 sayılı yazınız.

Üniversiteniz Fen Bilimleri Enstitüsü Doktora Öğrencisi Filiz ÇİÇEK' in **"Türkiye, Finlandiya ve Güney Kore örnek olayları: Sınıf düzeyinde eğitimsel BİT kullanım uygulamaları"** başlıklı tezi kapsamında çalışma yapma talebi Müdürlüğümüzce uygun görülmüş ve araştırmanın yapılacağı İlçe Milli Eğitim Müdürlüğüne bilgi verilmiştir.

Görüşme formunun (3 sayfa) araştırmacı tarafından uygulama yapılacak sayıda çoğaltılması ve çalışmanın bitiminde iki örneğinin (cd ortamında) Müdürlüğümüz Strateji Geliştirme (1) Şubesine gönderilmesini arz ederim.

Ali GÜNGÖR
Müdür a.
Şube Müdürü

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...slı İle Aynıdır.
27/02/2015

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YÖNETİM KURULU KARARI

Tarih : 29.01.2015
Sayı: FBE: 2015/ 22

GÖREVLENDİRME VE İZİN

Bilgisayar ve Öğretim Teknolojileri Eğitimi EABD doktora programı öğrencisi Filiz Çiçek'in 15 Şubat-30 Kasım 2015 tarihleri arasında "*Eğitimde teknoloji entegrasyonu bakımından Finlandiya-Kore ve Türkiye karşılaştırmalı durum çalışması*" başlıklı araştırmasına ilişkin hazırlanan anketi, ekli etik kurulu başvuru formunda belirtilen okullarda uygulama yapmak için görevlendirilme başvurusu incelenmiş; ilgili danışman görüşüne dayanarak adı geçen öğrencinin isteği doğrultusunda görevlendirilmesine oybirliğ ile karar verilmiştir.

Prof. Dr. Gülbin Dural *FBE Müdürü*	**Prof. Dr. Gürsevil Turan** *FBE Müd. Yard.*	**Doç .Dr. Sinan Gürel** *FBE Müd.Yard.*
Prof. Dr. Ayşen Savaş *Üye*	KATILAMADI **Prof. Dr. İnci Batmaz** *Üye*	**Prof. Dr. Serkan Dağ** *Üye*

Buk-Sung.

두 손 모아 스승 감사! 두 팔 벌려 제자 사랑!

서울교육대학교

수신자 서울북성초등학교장
(경유)
제목 ICT 국제 비교연구(한국-터키-핀란드) 협조 요청

1. 귀교의 발전을 기원합니다.

2. 다음과 같이 ICT 국제 비교 연구를 위하여 귀교를 방문하고자 하오니 연구 활동에 도움을 부탁드립니다.

\- 다 음 -

< 연구자 > **Filiz CICEK** Research Assistant
Department of Computer Education and Instructional Technology
Faculty of Education, Middle East Technical University
06531 Ankara / Turkiye
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< 연구 제목 >

터키, 핀란드, 한국 사례의 비교: 교실 수준에서 ICT 통합 교육
(Comparison between Turkey, Finland and South Korea Cases: Integration of Educational ICT Use at Classroom Level)

컴퓨터교육과학과장

학과장 홍명희 Hong

협조자

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Yoon-Joong M.S

두 손 모아 스승 감사! 두 팔 벌려 제자 사랑!

서울교육대학교

수신자 윤중중학교장

(경유)

제목 ICT 국제 비교연구(한국-터키-핀란드) 협조 요청

1. 귀교의 발전을 기원합니다.

2. 다음과 같이 ICT 국제 비교 연구를 위하여 귀교를 방문하고자 하오니 연구 활동에 도움을 부탁드립니다.

- 다 음 -

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< 연구 제목 >

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Kirjallinen oikaisuvaatimus on muutoksenhakijan, laillisen edustajan tai asiamiehen allekirjoitettava.

Viranomaiselle saapunutta sähköistä asiakirjaa ei tarvitse täydentää allekirjoituksella, jos asiakirjassa on tiedot lähettäjästä eikä asiakirjan alkuperäisyyttä tai eheyttä ole syytä epäillä.

Oikaisuvaatimuksen toimittaminen

Oikaisuvaatimus on toimitettava oikaisuvaatimusajan kuluessa osoitteella:

Savonlinnan sivistyslautakunta
Olavinkatu 27, 57130 Savonlinna

Kirjaamon puhelinnumero on 015-527 4000.

Faksinumero on 015-525 0222 ja sähköpostiosoite:
sivistys.virasto@savonlinna.fi

Sivistysviraston aukioloaika on maanantaista perjantaihin klo 8.00-16.00.

Oikaisuvaatimuksen voi lähettää postitse, lähetin välityksellä tai sähköisesti.

Postiin oikaisuvaatimus on jätettävä niin ajoissa, että se ehtii perille oikaisuvaatimusajan viimeisenä päivänä ennen kansliapalveluiden aukioloajan päättymistä.

Sähköinen viesti katsotaan saapuneeksi viranomaiselle silloin, kun se on viranomaisen käytettävissä vastaanottolaitteessa tai tietojärjestelmässä siten, että viestiä voidaan käsitellä.

Oikaisuvaatimus toimitetaan aina omalla vastuulla.

Tiedoksianto

Pöytäkirja pidetään yleisesti nähtävänä
sivistysvirastossa 13.10.2014
Päätös on annettu sähköpostilla 10.10.2014.

Edellä olevan todistaa

Aila Kosunen
Aila Kosunen
toimistonhoitaja

not going to evaluate teaching methods of teachers at all. Mainly, I am interested in how educational technology is used and, thus my interview questions will also be related to use of educational technology from different perspectives.

Interviews

Principles: When I arrive schools at first, I would like to talk to principles about general structure of the school, education system and infrastructure of the school. This will help me to gain an understanding of use of ICT in relation to school culture/ context.

Teachers: Firstly, I would like to observe the classrooms. After observations, I would like to interview teachers in order to gain deeper understanding of use of ICT in the classroom. Interviews will take approximately 30-40 minutes. Moreover, interviews and observations can be arranged based on teachers' requests and wishes. The interview sessions will be audio-taped and the recorded audio will be held with high confidentiality. Only my advisor and committee members of my dissertation will have access to tapes.

Content of interview questions: The interviews will include 4 general topics as follows: Descriptive information e.g. subject area, teaching grade level; Organizational level issues e.g. how are ICTs currently being used at the pre-service level to train teachers? ; School level issues e.g. Does the school have a plan on the use of ICT? ; Classroom level issues e.g. What is the main reason that you use / not use ICT in your practice?

If you have any questions related to this research plan, please don't hesitate to contact us.

Sincerely.

Filiz CICEK
Visiting Researcher / Ph.D Student
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phone: 0466138759

Eija Kärnä
Professor
email: eija.karna@uef.fi
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E .THE MAIL SENT TO PARTICIPANTS FOR MEMBER CHECK

Dear XXX,

I am Filiz CICEK, PhD researcher from Turkey. I had been a researcher at Eastern Finland University. We had interviewed with you about ICT integration in Finland. The reason for sending this mail is to request your confirmation on the transcribed data of our voice recording. Your conformation is a necessary step in my thesis to consider data reliability/validity.

I have attached the transcription document. Could you please review the document of our interview and make changes, if necessary? Please, use the “Review--Track Changes” option on the Word document, then I will be able to see the corrections.

I am looking forward to receive your conformation e-mail in 7-10 days. Thank you for your participation and collaboration.

Sincerely,

Greetings from Turkey.

Filiz CICEK

Research Assistant at METU

CURRICULUM VITAE

PERSONAL INFORMATION

Surname, Name	: Çiçek, Filiz
Nationality	: Turkish (TC)
Date and Place of Birth	: 6 May 1985, Aydın
Phone	: +90 544 343 28 41
E-mail	: filisis@gmail.com

EDUCATION

Degree	**Institution**	**Year of Graduation**
Ph.D.	METU-Computer Education & Instructional Technology	2019
BS	EGE University- Computer Education & Instructional Technology	2009
High School	Nazilli Anadolu High School, Nazilli	2003

ACADEMIC WORK EXPERIENCE

Year	**Place**	**Enrollment**
2011-2017	METU Faculty of Education - Computer Education and Instructional Technology Department	Research Assistant
2017 Spring Semester (2 months)	ISCTE University Institute of Lisbon - Science and Technology Department, School of Technology and Architecture	Researcher @ IRIS project (worked with Prof Dr. Miguel Sales Dias)
2015 Spring Semester	Seoul National University of Education - Computer Education Department	Visiting Researcher (worked with Prof. Dr. Myunghui Hong)
2014 Fall Semester	University of Eastern Finland Special Education in the Faculty of Philosophy	Visiting Researcher (worked with Prof. Dr. Eija Kärnä)
2010-2011	Mehmet Akif Ersoy University - Computer Education and Instructional Technology Department	Research Assistant

FOREIGN LANGUAGES

Advanced English

PUBLICATIONS, PROCEEDING PAPERS AND PRESENTATIONS

1. BRICOER: A Short Report on the Development of Educational Informationalization and Basic Education (2019) –Book Chapter in progress by Beijing Normal University Publishing Group.
2. Dogusoy B., Cicek F., Cagiltay K. (2016). How Serif and Sans Serif Typefaces Influence Reading on Screen: An Eye Tracking Study. In: Marcus A. (Eds) Design, User Experience, and Usability: Novel User Experiences. DUXU 2016. Lecture Notes in Computer Science, vol 9747. Springer, Cham.
3. Cagiltay, K., Karasu, N., Ozkubat, U., Demirkaya, M., Cakir, H., Kaplan-Akilli, G., Islim, O. F., Cicek, F. & Kara, E. (2015). Use of Technology in Teaching Daily Living Skills to Individuals with Intellectual Disabilities. AECT 2015, Indianapolis, IN, USA.
4. Çağıltay, K., Donmez, M. & CICEK, F. (2015). Eye-Tracker-Based Eye Training System for Children With Low Vision: Effectiveness and Usability. AERA 2015, 16-20 April, Chicago, IL, USA.
5. Cagiltay K., Cicek F., Karasu N., Cakir H., Kaplan Akilli G. (2014). Innovative Educational Technology for Special Education and Usability Issues. In: Marcus A. (eds) Design, User Experience, and Usability. User Experience Design for Everyday Life Applications and Services. DUXU 2014. Lecture Notes in Computer Science, vol 8519. Springer, Cham.
6. Çağıltay, K., CICEK, F., Karasu, N., Cakir, H., Kaplan-Akilli, G. (2014). Özel Eğitim için Yenilikçi Eğitim Teknolojileri. Uluslararası Engelsiz Bilişim Kongresi, 23-25 Eylül 2014 – İzmir, TR.
7. Çağıltay, K., Karasu, N., Cakir, H., Kaplan-Akilli, G. & CICEK, F. (2014). Innovative Educational Technology for Special Education and Usability Issues. HCI International 2014, Greata, GR.
8. Çağıltay, K., CICEK, F., Çetin-Kaya, Y. & Dikmen, F. (2014). Savunma Sistemleri Tasarimi ve İnsan Bilgisayar Etkileşimi: Hava Savunma Projesi Örnek Çalışması. SAVTEK 2014 7. Savunma Teknolojileri Kongresi, 25-27 Haziran 2014; ODTÜ/Ankara, TR.
9. Ozoran, D., CICEK, F. & Çağıltay, K. First Testing of a Kinect- Based Game in Special Education: "Magic Hands" AERA 2014, Phidelphia USA.
10. CICEK, F., İslim, Ö. F., & Çağıltay, K. Evaluation of a Mob ile Phone Based Student Immediate Feedback System. AECT 2013 Anaheim, CA, USA.
11. CICEK, F. & Çağıltay, K. (2013). What Do Heuristics Mean to Instructional Designers? AECT 2013 Anaheim, CA, USA.
12. CICEK, F., İslim, Ö. F., Uğur-Erdoğmuş, F., Çagiltay, K., Kaplan-Akilli, G.,Çakir, H. & Karasu, N. (2013). Özel Eğitim İçin Yenilikçi Eğitim Teknolojileri: Uzman Görüşleri. 1st Instructional Technologies and Teacher Education Symposium (ITTES), (1), 150-152,June 26-28. Trabzon.

13. Hong, M. , CICEK, F. & Cagiltay, K. (2013). Comparison of Turkish and South Korean ICT use in Education. 7th International Computer and Instructional Technologies Symposium (ICITS), (7), 459-460, June 6-8, Erzurum.
14. Kamalı, T. , CICEK, F. & Yıldırım, Z. (2013). History Learning Throughout Computer Based Concept Maps: An Example of Ottoman Period. 7th International Computer and Instructional Technologies Symposium (ICITS), (7), 149 -150, June 6-8, Erzurum.
15. CICEK, M. ,CICEK, F.,Yılmaz, Y., Tuzlu, M. & Yıldırım, S. (2013). The FATIH Project: Through the Lens of Computer Teachers and Classroom Teachers. 7th International Computer and Instructional Technologies Symposium (ICITS), (7), 95-96, June 6-8, Erzurum.
16. Uzunosmanoğlu, S., D., CICEK, F. & Duman, M (2012). Trends in M-Learning. Paper presented at 6th International Computer and Instructional Technologies Symposium (ICITS) 2012, Gaziantep,TR.
17. CICEK, F. & Kokoç, M. (2011), Why college students don't use Facebook? 5th International Computer and Instructional Technologies Symposium (ICITS) 2011 Elazığ, TR.

PROJECTS - WORKS

Year	**Place**	**Enrollment**
2017 - Summer	ZaferIn Agency - a European Union Project which aimed to increase adaptability of employers and employees of SMEs in TR33 Region	Non-Key E-Learning Expert
2015-2016	Seoul, Korea - Classting Inc - a social media platform for the classroom, Classting, was translated from English to Turkish in order to launce the app in Turkey	Translator
2012-2015	TÜBİTAK Project: -Teaching Basic and Cognitive Concepts to Students with Special with the help of Technology Enhanced Learning Environments and investigation of the effectiveness of it	Researcher
2013-2014	ASELSAN – METU - Testing Usability Issues of User Interface Design of Air Defense Command and Control Software	Usability Expert

HOBBIES

Pilates, Yoga, Fitness, Health & Nutrition, Travelling, Oil Painting, Reading