

PRE-SERVICE TEACHERS' BELIEFS, EXPERIENCES AND PERCEPTIONS
ON MOBILE GAMES

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PERCEPTIONS ON MOBILE GAMES**

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ABSTRACT

PRE-SERVICE TEACHERS' BELIEFS, EXPERIENCES AND PERCEPTIONS ON MOBILE GAMES

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With the passing years, mobile platforms rapidly turn into preferred platforms for casual games, and there is a sharp increase and growth in the number of these platforms. Games can provide an enhanced learning experience. Today's students already own advanced mobile devices and they use them for educational purposes personally such as searching information on the Internet or accessing the course materials. Introducing pre-service teachers to mobile games can enable the advantages of mobile educational games in classroom settings by employing this already present technology. The purpose of this study is to investigate pre-service teachers' beliefs in integrating mobile games into teaching, and perceptions on the barriers and enablers in integrating mobile games into teaching after engaging them in an educational mobile game design and development process. This study also explores pre-service teachers' experiences about mobile games. This study employed a mixed methods research design. Participants were 50 pre-service teachers from the departments of Early Childhood Education, Computer Education and Instructional Technology, Elementary Science Education, and Foreign Language Education at Middle East Technical University. The participants were engaged in training for 3 weeks. Then they were engaged in an educational mobile game design and

development activity (mini-game project). Twenty-seven participants completed the mini-game project. Afterwards, the data were collected through a perception survey from 50 participants which was followed by semi structured interviews that conducted with 13 participants that are selected from the participants who successfully completed the mini-game project. The results indicated that pre-service teachers already had casual gaming experience. They showed positive opinions on game based learning and integration of educational mobile games into teaching. Their awareness towards educational game use in classroom was increased. The pre-service teachers expressed willingness to integrate mobile games in their future profession. The results also revealed the main enablers and barriers in integrating educational mobile games into classroom settings both in terms of creating a mobile game and using an already existing mobile game. Benefits of using or creating a game, the game being accessible and easy to use, teacher's personal interest and game based learning knowledge of teacher are some of the enablers that were found. As for the barriers, learning environment and technology related barriers, teachers' characteristics and beliefs towards technology, content appropriateness for game implementation, and barriers related to mobile game design and development process were noted.

Keywords: Game based learning, video games, educational mobile games, pre-service teacher education

ÖZ

ÖĞRETMEN ADAYLARININ MOBİL OYUNLARA YÖNELİK GÖRÜŞLERİ, DENEYİMLERİ VE ALGILARI

Güleroğlu, Merve

Yüksek Lisans, Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü

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Mobil aygıtlar zamanla gündelik oyun oynamak için tercih edilen platformlar haline gelmektedir ve bu aygıtların çeşitliliği hızla artmaktadır. Oyunlar öğrenciye daha iyi bir öğrenme deneyimi sağlayabilmektedir. Günümüz öğrencileri, gelişmiş mobil aygıtları İnternet’te bilgi aramak ve ders materyallerine uzatan erişmek gibi amaçlarla halihazırda kişisel olarak kullanmaktadırlar. Öğretmenlik adaylarını mobil oyunlarla tanıştırmak, onları mobil oyunların avantajlarını kendi yararlarına sınıf içerisinde kullanabilmelerine olanak sağlayabilir. Bu çalışmanın amacı bir eğitsel mobil oyun tasarım ve geliştirme sürecine tabi tutulmuş öğretmen adaylarının mobil oyunlara yönelik düşünceleri ile mobil oyunların eğitime entegrasyonuna olanak sağlayan ve engel olan etmenlere yönelik algılarını ortaya koymaktır. Bu çalışma aynı zamanda öğretmenlik adaylarının mobil oyunlara yönelik deneyimlerini de incelemektedir. Araştırmada karma yöntem kullanılmıştır. Katılımcılar Orta Doğu Teknik Üniversitesi’nin Okul Öncesi Öğretmenliği, Bilgisayar ve Öğretim Teknolojileri Eğitimi, İlköğretim Fen Bilgisi Öğretmenliği ve İngilizce Öğretmenliği bölümlerinde öğrenim görmekte olan toplam 50 öğretmen adaydır. Katılımcılar üç hafta süren eğitimin ardından bir eğitsel mobil oyun tasarlama ve geliştirme sürecine dahil edilmişlerdir (mini-oyun projesi). Toplamda 27 katılımcı mini-oyun projesini

tamamlamıştır. Sonrasında nicel veriler 50 katılımcının tamamına uygulanan anket ile toplanmıştır. Nitel veriler ise mini-oyun projesini başarıyla tamamlayan katılımcılar arasından seçilen 13 kişi ile yapılan yarı yapılandırılmış görüşmeler aracılığıyla toplanmıştır. Araştırma sonuçları, öğretmen adaylarının halihazırda gündelik oyun deneyimlerinin bulunduğunu ortaya koymuştur. Öğretmen adayları oyun tabanlı öğrenmeye yönelik olumlu görüş sergilemiştir. Bu çalışma sonrasında öğretmen adaylarının sınıfta eğitsel oyun kullanımına yönelik farkındalıkları artmıştır. Öğretmenlik hayatlarında eğitsel mobil oyunları derslerine entegre etmek istediklerini dile getirmişlerdir. Sonuçlar ayrıca mobil oyunların eğitime entegrasyonuna olanak sağlayan ve engel olan bazı etmenleri, hem oyunları direkt kullanmak açısından hem de öğretmenin kendi mobil oyununu geliştirmesi açısından ele alarak ortaya koymuştur. Bir oyunu geliştirmenin veya kullanmanın faydaları, oyunun erişilebilirliği ve kullanım kolaylığı, öğretmenin oyun tabanlı öğrenme bilgisi ve buna ilgi duyması, mobil oyun entegrasyonuna olanak sağlayan etmenlerden bazılarıdır. Mobil oyun entegrasyonuna engel olan etmenlerden bazıları ise öğrenme ortamı ve teknoloji ile ilgili engeller, öğretmenin özellikleri ve teknolojiye yönelik görüşleri, ders içeriğinin oyun uygulamasına elverişli olması ve de oyun geliştirme sürecine ilişkin engeller olarak bulunmuştur.

Anahtar kelimeler: Oyun tabanlı öğrenme, video oyunlar, eğitsel mobil oyunlar, hizmet öncesi öğretmenlik eğitimi

To my inspirational uncle Ayhan Gülerođlu

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CHAPTER 1

INTRODUCTION

This chapter presents background of the study, problem statement, purpose of the study, research questions, significance of the study, and definition of terms.

1.1 Background of the Study

Video games have been in our lives for a very long time. Long before the personal computer usage became common, legacy game consoles such as “Atari Video Computer System” (in 1970s) or “Nintendo Entertainment System” (in 1980s) were very popular (Bakie, 2010). The rapid change in technology has brought a new dimension to the world of video games. Game platforms have stunningly developed and changed, while video games have kept their popularity. Gaming experience has become much richer than it was before (Squire, 2003). They provide a powerful medium for educational purposes (Squire, 2008). The first notable educational game, “Oregon Trail”, was designed in 1971 and became popular in 1980s (Bakie, 2010, p. 35). With the passing years, mobile platforms have rapidly turned into preferred platforms for casual games, and there is a sharp increase and growth in the number of these platforms (such as iPod touch and Nintendo DS). Educational casual games can be delivered through these platforms according to schedule and preference of learners and satisfy the needs of educators and educational institutions (Klopfer, Sheldon, Perry & Chen, 2012). The rapid development of mobile devices could result in the development of more adequate educational games in order to increase the learning effectiveness (Furió, González-Gancedo, Juan, Seguí, & Rando, 2013). It is likely that the developments in the portable technology for individual use could alter the prospective instructional use of technological devices, and these technologies in the form of instructional tools such as a video game point to a promising future

(Rosas et al., 2003). As soon as instructionists found out the potential of educational use of video games, they did not wait for the games to have a certain format for integrating in schools or integrating learning content in games (Kafai, 2006). Meanwhile, the researchers kept their focus on what kind of a potential the video games hold.

Previous research revealed various positive aspects of video games that help forward education. Increased attention and concentration during educational game play compared to traditional classroom practice without game use was one of them (Rosas et al., 2003). Video game use assured fun and motivation in the classroom (Berns, Gonzalez-Pardo, & Camacho, 2013; Rosas et al., 2003) and this encouraged students to learn naturally (González-González & Blanco-Izquierdo, 2012). Gee (2003) states that good games provide high motivation which derives learning. Furthermore, video games allow learners to learn by doing (Squire, DeVane, & Durga, 2008), especially making science activities relevant and meaningful (Foster, 2008). Critical thinking, creative thinking, and evaluation skills are increased by game based learning scenarios (Karadag, 2015). Collaborative games support social and technical skills, as well as developing a good learning rhythm, challenge, and making sense of difficulties (Berns et al., 2013; González-González & Blanco-Izquierdo, 2012; Proserpio & Magni, 2012). By means of their potential to provide immediate feedback, collaboration and competition, they constitute highly interesting, motivating, effective learning environments (Berns et al., 2013).

Game use in education has evolved rapidly and differently in line with technology. At first, the concept of “Game Based Learning” was mainly associated with computers. Back then, computers were highly regarded as significant for future classrooms. It was suggested to provide each classroom with increased numbers of computers (Mcalister, Dunn, & Quinn, 2005). However, computers have been leaving their popularity to mobile technologies recently. Rosas et al., (2003) suggested that a portable technology such as Personal Digital Assistants (PDAs) could change the future use of video games for instruction. Before it was too long, PDAs lost their popularity. Smart phones and tablets that are highly customizable

and capable of carrying out many tasks have replaced PDAs. Those can improve the gaming experience by even allowing multiplayer gaming (Furió, González-Gancedo, Juan, Seguí, & Rando, 2013). They also provide instant access when needed and allow 'just-in-time' learning by making it possible to play games anywhere anytime, for example in students' idle time on a bus (Lavín-Mera, Moreno-Ger, & Fernández-Manjón, 2008). These mobile devices such as smart phones and tablets are owned by many students, so it would not cause an additional or excessive cost. With the continuous improvements of mobile devices, educational mobile games will be designed and developed to be more effective throughout learning process (Furió, González-Gancedo, Juan, Seguí, & Rando, 2013).

There are some barriers in integrating games into instruction. Although teachers are generally sympathetic to employ game based learning, only a few have used games in their teaching (Noraddin & Kian, 2015). They are willing to use such technologies when guided; but alone, they lack skills in adopting that technology which limits their capacity and confidence (Razak, Connolly, & Hainey, 2011). Some of them think that learning and using such technology requires too much effort, and it gets even harder with the heavy workload that they already have (Becker, 2007; Can & Cagiltay, 2006; Kebritchi, 2010). In addition to the personal ones, environmental factors matter as well. These technologies might not be available to the entire classroom or there might be a lack of technological support. At this point, teachers face a technological challenge in integrating games into teaching (Romero & Barma, 2015).

Besides, some teachers are not aware of the potential of the content and pedagogical opportunities that video games offer (Prensky, 2003; Schrader et al., 2006). This may result in thinking that using games is not worth the effort required (Can & Cagiltay, 2006). Schrader et al. also mentioned that the educational gaming is viewed as a simple reward rather than an educational tool by teachers who are not aware of the value of educational gaming. Video games are not perceived as tools that can improve their job performance by some teachers (Bourgonjon, Valcke, Soetaert, & Schellens, 2009). Furthermore, in the practice, it can be seen that parents and

teachers are not only closed to the idea of bringing gaming into classrooms, but cannot even stand seeing a kid with a hand-held video game device at school corridors (Steinkuehler, 2010).

Today, students already own advanced mobile devices and they use them for educational purposes personally such as searching information on the Internet or accessing the course materials (Mai, 2014). What all teachers have to do in order to enable the advantages of mobile educational games is to learn how to link the curricular needs and the game strategies (Romero & Barma, 2015). Introducing teachers, especially pre-service teachers since they are the teachers of future classrooms, to game based learning practices will allow them to make use of existing games with relevant content as well as sorting their own game based learning content (Can & Cagiltay, 2006; De Grove, Bourgonjon, & Van Looy, 2012; Kenny & McDaniel, 2011). Including game based learning focused courses into higher education of pre-service teachers can be a good solution to overcome this issue (Razak et al., 2011). If such adoption is to happen at a wider scale, there is a need for comprehending what the teachers think about digital games. The basic answer satisfying this need is the perception and attitudes that the teachers have for digital games (Noraddin & Kian, 2015).

1.2 Problem Statement

Integration of an innovation such as mobile educational games into classroom can only be possible through the support of teachers. Although teachers found to be motivated to employ game based learning, only a few have used games in their teaching. Possible reasons why and barriers that might be hindering the adoption and integration of such games should be investigated (Noraddin & Kian, 2015).

Teachers are in uncertainty and this uncertainty is originated from their lack of knowledge about the digital world. Teachers do not speak the same language as the new generation so they do not know how to design best learning that meets students' need (Prensky, 2003). Additionally, even though an opportunity to use games is

offered to them, this time they have no idea how exchanging, sharing, meeting, evaluating, coordinating, programming, searching, customizing, and socializing work in such context. They need guidance to understand how to make decisions about when, how and which games might particularly serve their educational purposes (Becker, 2007). One way to satisfy this need can be making teachers and pre-service teachers familiar with game based learning approaches. Especially before considering any practical issues, teachers should be informed about these games (Bourgonjon et al., 2013). Then the perceptions and attitudes of teachers or pre-service teachers towards video games should be investigated in order to understand their intention of use in their practice (Noraddin & Kian, 2015).

1.3 Purpose of the Study

The purpose of this study is to investigate pre-service teachers' personal beliefs in integrating mobile games into teaching, and perceptions on the barriers and enablers in integrating mobile games into teaching after engaging in an educational mobile game design and development process. This study also explores pre-service teachers' personal experiences about mobile games.

1.4 Research Questions

The main research questions driving this study are as follows:

- 1- What are pre-service teacher's beliefs in integrating mobile games into teaching?
- 2- What are pre-service teachers' perceptions on the enablers in integrating mobile games into teaching?
- 3- What are pre-service teachers' perceptions on the barriers in integrating mobile games into teaching?
- 4- What are pre-service teachers' experiences about mobile games?

1.5 Significance of the Study

Mobile devices are highly popular and commonly used by the youth today. These versatile state-of-the-art devices carry a great potential for enabling technology in the classrooms. Majority of the students already own such devices, so this technology is actually present in the classrooms which means that using mobile devices in the classrooms for game based learning purposes will not cause any extra or additional cost (Lavín-Mera et al., 2008). Moreover, although research of game based learning and pre-service teacher perceptions is a popular topic, most of the research in the literature focus on complex off-the-shelf video games that run on computers or game consoles rather than simple mini-games that are supported by smart phones or tablets. Furthermore, only a limited number of studies focus on actively involving teachers or pre-service teachers in an educational game design and development process. Since this study focuses on pre-service teachers' perceptions on mobile games and integration after engaging them in an educational mobile game design and development process, it has the potential to contribute to the literature and help filling this gap.

Currently, there are not enough educational game applications available on mobile application markets (such as Google Play Store) that especially will meet the course objectives of Turkish education system. Romero and Barma (2015) suggest that pre-service teachers need to learn how to customize, repurpose, and create games instead of expecting to find off-the-shelf games that will perfectly satisfy their teaching needs. The mobile educational game design and development process that the pre-service teachers engaged in this study will hopefully enable them to customize, repurpose and create games.

Furthermore, although the strengths of video games for educational use are well-known as they have been studied a lot, they are limited with the barriers which are in the way of integration of video games into practice. In addition to this, there is a disconnection between games and classrooms (Steinkuehler, 2010). Introducing pre-service teachers to educational video games will help them to gain insight about such technologies and understand the purpose and nature of these games for different

cases (Can & Cagiltay, 2006). Having the pre-service teachers introduced to mobile games, this study will help alleviate this disconnection between games and classroom, even though it might be a long term outcome.

The results of this study may be helpful to the future studies that aim at overcoming the barriers in integrating educational mobile games into teaching.

1.6 Definition of Terms

Video Game: A video game is an electronic game that involves human interaction with a user interface to generate visual feedback on a video device. Video game is technically a broader term than a computer game. Today they are usually used interchangeably.

Mobile Game: A type of video game that specifically runs on mobile platforms such as smart phones and tablets. In this study, the term Mobile Game and Mini-Game are used interchangeably.

Serious Game: An educational game genre that has emerged in order to teach adults real-world events in an entertaining manner (Bakie, 2010).

Mini-game: Video games that have little complexity and usually provide one single type of challenge along with minor variations (Prensky, 2005). Mini-games also can be a part of a larger traditional game that are a reward for completing a challenge or unlocked by discovering a secret (Bakie, 2010). In this study, the term Mobile Game and Mini-Game are used interchangeably.

Pre-service Teacher-Student Teacher: Teacher candidates who are still in the level of undergraduate study.

CHAPTER 2

LITERATURE REVIEW

The current and related literature has been reviewed in this chapter. There are four main parts as (1) Video Games and Learning, (2) Mobile Learning and Games, (3) Video Games and Teachers, (4) Summary. In Video Games and Learning part, firstly, findings in the literature related to educational video games are presented. Secondly, the studies that engaged teachers or pre-service teachers in a game-based learning design process are summarized. In Mobile Learning and Games part, a brief overview is given. Then, the recent studies that focus on mobile educational games are summarized. In the third part, Video Games and Teachers, perceptions of pre-service and in-service teachers of video game use in education are presented. The chapter is closed with a summary of the literature reviewed.

2.1 Video Games and Learning

Video games have been in our lives for a very long time. Long before the personal computer usage became common, legacy game consoles such as “Atari Video Computer System” (in 1970s) or “Nintendo Entertainment System” (in 1980s) were very popular (Bakie, 2010, p. 8). With the popularity of video games, the instructionists found out the potential of utilizing such games for education. The first notable educational game, “Oregon Trail”, was designed in 1971 and became popular in 1980s (p. 35). Game platforms have stunningly developed and changed, while

video games and game based learning have kept their popularity. Gaming experience has become much richer than it was before (Squire, 2003).

2.1.1 Educational Video Games

The rapid change that technology has been through causes a gap between how educators and parents expect children to learn in school, and how children actually learn outside the school (Hamlen, 2009). Prensky (2003) points out that the children of new generation have highly positive attitudes toward video games while they simply refuse to show interest to what has been taught at school. Hamlen (2009) adds that the bridge between the expectations of children and educators and parents is important in order to keep schooling activities effective and engaging for the children. Video games provides a massive reach for students (Furió, González-Gancedo, Juan, Seguí, & Rando, 2013).

The use of video games assures motivation in the classroom (Malone & Lepper, 1987; Rosas et al., 2003; Sheldon, 2012). Berns, Gonzalez-Pardo, and Camacho (2013) reiterate that video games bring motivation to the classroom as well. Gonzalez-Gonzalez and Blanco-Izquierdo (2012) adds that motivation that is provided by the video game encourages students to learn naturally so it leads to a motivating and effective learning environment. Especially mini-games are great motivators to practice particular skills (Prensky, 2005). Motivational forces in a game can be “a repeating cycle of user judgments, behavior, and feedback that characterizes the engagement that game players display” (Garris, Ahlers, & Driskell, 2002, p. 458). Garris et al. explained that these motivational forces could be utilized with suitable instructional content in order to achieve desired learning outcomes. Similarly, Huang & Huang (2015) found in their study that the scaffolding vocabulary game they utilized was not only helpful to low-achieving students in terms of supporting their vocabulary learning, but also helpful for generating their learning motivation. Another study on a language learning game by Liu & Chu (2010) showed a positive relationship between motivation and learning outcomes.

Fun factor and enjoyment in games appear to have a relationship with motivation to play a game. A study by Park, Baek, Ohm, & Chang (2014) suggests that perceived enjoyment is one of the factors that motivates players to keep playing a game. Moreover, enjoyment in a game stimulates students' learning interest (Lijuan Wang & Ha, 2009). The findings of Giannakos (2013) showed that the higher enjoyment learners experienced in a game, the more likely they were to acquire knowledge. Malone (1980) described the elements that made games fun as (1) challenge, (2) fantasy, and (3) curiosity. Fun and enjoyment are essential features of games. Even when the learning content was professionally embedded in a game, the users were found to like the game features most (Schwabe & Goth, 2005).

Educational games provide a concentrated state. Squire (2006) mentions video game playing as "immersive interactive digital entertainment" in his study (p. 19). The key factor of a game that draws the player into the game is immersion or concentrating the attention on the game (Sheldon, 2012). In a study by Rosas, Nussbaum, and Cumsille (2003), the findings showed that the kids increased their attention and concentration while playing an experimental video game, compared to classroom practice without game use. "Concentration on the task at hand" is one of the major components of flow state described by Csikszentmihaly (1990, p. 58). In a recent study (Hamari et al., 2016), impact of flow, engagement, and immersion on learning in an educational video game were investigated. The results showed that educational video game increased students' engagement in terms of concentration, interest, and enjoyment during the learning activity. The educational video game also promoted the students' flow experience. Hamari et al. indicated that increased engagement and flow experience had a positive effect on learning. Hung, Sun, & Yu (2015) also assert that gaming process promoted engagement and satisfaction among their participant students which led the students to experience an effective learning flow and improve their learning achievement.

Video games allow learners to learn by doing; further, not only doing it in a powerful virtual world but also allowing learner to be a part of that world (Squire, DeVane, & Durga, 2008). This brings the state of being in a third space (Steinkuehler &

Williams, 2006), becoming a third actor as it allows making connections between different learning sites (Meyer, 2013). This especially takes the attention of science educators. The games have the capability of making science activities relevant and meaningful as well as showing the applicability of the activity outside of the school (Foster, 2008).

A study with integrated maths mini-games showed that the games not only promoted students' multiplicative operation skills, but also their insight in multiplicative number relations (Bakker, van den Heuvel-Panhuizen, & Robitzsch, 2015).

Group activity develops a good learning rhythm, challenge and sense making of difficulties (Berns et al., 2013). Collaborative games support social and technical skills to be developed (González-González & Blanco-Izquierdo, 2012). Team play in games require each team member to take on a different role, and work in collaboration with the other team members which is similar to the demands of the modern world (Gee, 2005). Moreover, the competition and collaboration that games provide are the reasons why the games are motivating contexts (Berns et al., 2013). All these features might be linked somehow. In-game group activities promote a good learning rhythm, challenge and sense making of difficulties (Proserpio & Magni, 2012). With the emergence of online technologies, online gaming has made anytime/anywhere social interaction and collaboration possible (Steinkuehler & Williams, 2006).

Gonzalez-Gonzalez et al. point out that other than games; gaming communities also allow social learning to take place regardless of the game content. Gaming communities provide gamers with a socially interactive space where discussion and sharing of interpreted experience between novice and experience players occur (Gee, 2009). Sung & Hwang (2013) assert that students' learning performance increased as they discussed and organized the knowledge they acquired through games.

2.2 Mobile Learning and Games

Mobile learning could be defined as “any educational provision where the sole or dominant technologies are handheld or palmtop devices” (Traxler, 2005, p. 262). Although a certain definition and conceptualization on mobile learning has not been done yet, mobile learning carries some essential characteristics such as being personal, contextual, and situated (Traxler, 2007). Traxler adds that mobile learning makes accessing information and knowledge possible anywhere anytime. This promotes ‘context-awareness’ which was described by Kukulska-Hulme (2010) as “awareness of one’s surroundings and their potential to provide information and rich learning experiences” (p. 4). Communication capabilities of mobile technology allows learners to get connected with each other all over the world and share information (Ally, 2013).

Today, students already own advanced mobile devices and they use them for educational purposes personally such as searching information on the Internet or accessing the course materials (Mai, 2014). Especially in the developing countries, there is a tendency to move directly to mobile devices because such devices are more affordable compared to computers so mobile device use is pretty common (Ally, 2013). Smart phones and tablets that are highly customizable and capable of carrying out many tasks have got off the ground. Those can improve the gaming experience by even allowing multiplayer gaming (Furió, González-Gancedo, Juan, Seguí, & Rando, 2013). They also provide instant access when needed and allow ‘just-in-time’ learning by making it possible to play games anywhere anytime; for example, in students’ idle time on a bus (Klopfer, Sheldon, Perry, & Chen, 2012; Lavín-Mera et al., 2008). What all teachers have to do in order to enable the advantages of mobile devices regarding mobile educational games is to learn how to link the curricular needs and the game strategies (Romero & Barma, 2015).

Mobile devices has been becoming the mainly preferred platform for casual gaming (Klopfer et al., 2012). Furió et al. (2013) suggest that as the mobile devices improve, educational mobile games could be designed to be more effective regarding learning

process. Similarly, as the game industry develops, the learning support of games could be used by teachers more often (Squire et al., 2008).

2.2.1 Research on Educational Mobile Games

Educational mobile games have become a popular research area in recent years. Although mobile learning has been studied extensively, research on educational mobile games is still limited in scope.

In a study, Hung, Sun, & Yu (2015) aimed to test two types of tablet PC (TPC) based games regarding students' performance and flow experience. The game tested was an iPad application called *Motion Math: Hungry Fish* which provided a challenging and a matching game type at the same time. The researchers defined Level 1-6 as a matching game which was played by the control group, and Level 7-14 as challenging game which was played by the experimental group. The participants were 52 second-grade students. The results showed that the students in the experimental group (challenging game) achieved better flow experience, learning performance, and satisfaction.

Another study was conducted by Huang & Huang (2015). This study focused on the development of a scaffolding handheld sensor-based vocabulary game and evaluating its efficiency in terms of students' performance, retention, and motivation. The game supported mobile devices (controlled through accelerometer sensor) and PCs (controlled using keyboard and mouse). The participants were 65 freshmen in a university in Taiwan. The results showed that the game helped low-achieving students greatly in vocabulary learning, and motivating them. The game was not effective in retaining students' memory of the vocabulary. The researchers point out that the game needs improvement regarding difficulty levels to serve medium and high achievers, and providing listening and writing practice.

Martin-Dorta et al. (2013) conducted a study that focused on the validation of a 3D mobile game application "Virtual Blocks". This mobile game was designed to help

engineering students improve spatial abilities. The participants were 26 freshmen engineering students. The results showed that *Virtual Blocks* was an efficient game in terms of promoting its users' spatial abilities. Additionally, the mobile game increased students' motivation and satisfaction.

In another study, impact of coupled games on learning experience of learners at-risk was studied by Schmitz, Klemke, & Specht (2013). The coupling games in this study were comprised of two components: SMS notifications as a quiz, and a PC-based browser game called *BauBoss*. The purpose of *BauBoss* was to promote IT knowledge by asking questions. The participant received the question as an SMS and if he answered it correctly, then he would gain an in-game advantage. The PC extension was shared by all participants, and only the quickest two participants who answered a question correctly would receive the bonus. Nineteen learners participated in this study. The data were collected through a questionnaire and interview. The results showed that the learning environment that the coupled games provided helped increase at-risk learners' motivation and knowledge gain. The coupled games were found to have a potential to support learning activities.

Another study was conducted by Furió, González-Gancedo, Juan, Seguí, & Rando (2013) to compare an iPhone and a traditional game regarding learning outcomes. They first conducted a study with 150 education professionals to determine their subject preferences for the game. Then, according to the results of the first study, a second one was conducted with 84 children aged 8-10 years old in order to compare the iPhone and the traditional game. The difference between two games was that the iPhone game was autonomous, and it did not require any guidance while the traditional game required guidance and supervision. The results of the second study showed that there was no significant difference between iPhone game and traditional game groups' learning outcomes. A vast majority of the students stated that they would prefer iPhone game over the traditional game.

In their study, Klopfer, Sheldon, Perry, & Chen (2012) attempted to understand how students use educational games while there are additional distractions on their mobile

devices. They also focused on how those games could be made practical, appealing, and educationally useful. The game, *Weatherlings*, aimed to teach the kids about weather and climate. The pilot study was conducted with 20 students aged 10 or 11. The students did not have a formal instruction about weather. They played the game outside the classroom on the Android-based mobile phones for 3 days. On the 4th day, a follow-up discussion was conducted by them. The results showed that the students were engaged in the game and learned the content. Additionally, the students willingly spent their spare time on an educational game. Moreover, the students had an increased interest towards the content.

Another study was conducted by Liao, Chen, Cheng, Chen, & Chan (2011) in order to design and develop a game, *My-Mini-Pet*, which is a handheld pet-nurturing game with learning features. The game had 3 strategies. According to the first one, if the player took a good care of the pet, the pet would become healthy and happy. As for the second one, as the player completed learning tasks, the pet's appearance would improve. Thirdly, the pet would provide feedback according to the player's learning progress. In total, 9 students that are 10 years old participated in this study. Every student was provided with a PDA. The data were collected through game logs, observation, and interviews. The results showed that the followed strategies engaged the students in the learning activities. The game promoted discussion between students as well as increasing their attention.

2.3 Video Games and Teachers

Current studies about video games and teachers mainly focus on perceptions of teachers/pre-service teachers on video games, the factors influencing acceptance, adoption or intended video game use of teachers/pre-service teachers, and experiences of teachers/pre-service teachers.

Some studies show that pre-service teachers are found to enjoy playing video games and to be open to try new technological applications (Chen, Chen, Chen, & Yang, 2012; Hsu & Chiou, 2011; Schrader et al., 2006).

In a correlational study that was conducted with exemplar teachers, Proctor & Marks (2013) found that teachers' perception on "usefulness" of educational video games was important pre-requisite for game use. Ray & Coulter (2010) found in their study which was conducted with pre-service teachers that being exposed to mini-games changed the participants' perceptions of usefulness towards the game use. Additionally, Becker (2007) points out that teachers should not be expected to understand the usefulness of games and use them without having ever played one. Therefore, she suggests that teachers need to be encouraged to play games. In a study that focused on usefulness, games were declared by teachers to be useful for language teaching (Chen et al., 2012). Similarly in other studies, pre-service teachers stated that they found educational video games useful in terms of increasing student interest to the subject matter, maintaining retention, visualizing concepts, providing a fun learning environment, reinforcement and improving reasoning skills (Hsu & Chiou, 2011; Topçu, Küçük, & Göktaş, 2014). As for teachers themselves, on the contrary, the study of Bourgonjon et al. (2013) showed that teachers did not perceive video game tools useful in terms of improving their job performance and making their job easier.

As for the video gaming experience, the study of Bourgonjon et al. (2013) exposed that their participant teachers had no previous experience with video games. Ertzberger (2008) also states that the teachers were found to have very low familiarity with video games. In terms of video game familiarity, Ertzberger investigated "(a) use of video games for leisure, (b) use of video games as instructional tools, and (c) the amount of formal training each participant had in the use of video games (d) desire of participant to receive training in video games, and (e) the desire of the participant to use game templates" (p. 116).

A study by Noraddin & Kian (2015) showed that the teachers had positive attitude towards the educational use of video games, however, they still did not prefer using video games at all. Demirbilek (2010) conducted a survey in eight European countries, and he found that the most of educators stated willingness to use games in their teaching. They especially expressed interest to utilize those games on mobile devices. Although the educators were found to be using mobile devices for educational purposes, only half of them was using games in that sense (Demirbilek, 2010). Topçu et al. (2014) and Hsu & Chiou (2011) also had similar findings pointing out that their participant pre-service teachers stated willingness to use educational video games in their future practice, but they also expressed that they did not find themselves qualified enough for using educational video games.

Teachers are also found to be motivated to employ game based learning when they are guided, but when they are alone, they lack skills in adopting that technology which limits their capacity and confidence (Razak et al., 2011). In brief, it can be said that there is an interest toward game use in education, but there is also uncertainty (Becker, 2007).

The uncertainty that the teachers are in is originated from their lack of knowledge about the digital world. Teachers do not speak the same language as the new generation, so they do not know how to design best learning that meets students' need (Prensky, 2003). Additionally, even though an opportunity to use games is offered to them, this time they are not knowledgeable about how the exchanging, sharing, meeting, evaluating coordinating, programming, searching, customizing, and socializing work in game based learning context. They need guidance to understand how to make decisions about when, how and which games might particularly serve their educational purposes (Becker, 2007).

Many studies spotted the same issue that the use of game based learning in school environments/formal education was limited because of the fact that the curriculum was not flexible enough (Baek, 2008; De Grove et al., 2012; Kebritchi, 2010). A more specific outcome has been declared by Proctor and Marks (2013) that the

teachers' adoption of game use for the students aged 6-12 is lower than the other age groups because of the more divergent and complex curriculum. Ertzberger (2008) adds that relevance of curriculum and video games has to be ensured according to teachers.

Some of the teachers also have doubts regarding classroom management. Pre-service teachers stated that video game use might make classroom management difficult for them (Topçu et al., 2014). The experienced teachers who have strong technical background might feel more comfortable in using such new technologies in their classroom settings compared to the ones who do not (Can & Cagiltay, 2006). However, the most experienced teachers might be reluctant in adopting a new technology so they might feel more comfortable going with fixed schedules (Kebritchi, 2010).

Some teachers are not aware of the potential of the content and pedagogical opportunities that video games offer (Baek, 2008; Schrader, Zheng & Young, 2006; Prensky, 2003). Can and Cagiltay (2006) found in their study that half of their participant pre-service teachers stated that they found game playing a waste of time. This may result in thinking that using games is not worth the effort required (Can & Cagiltay, 2006). Park et al. (2014) add that the time spent on games is viewed by the educators as it may result in academic failure or decrease in academic achievement. However, even commercial game play without any educational purposes can be helpful for academic achievement in terms of kids' social problem solving, collaboration and cooperation skills (Kim et al., 2009). Schrader et al. (2006) also mentioned that the educational gaming is viewed as a simply reward rather than an educational tool by teachers who are not aware of the value of educational gaming.

Learning environment and technological equipment in a school can be counted as concerns of both teachers and pre-service teachers in the literature (Baek, 2008; Bensiger, 2012; Ertzberger, 2008; T. Hsu & Chiou, 2011; Romero & Barma, 2015; Topçu et al., 2014).

The studies showed both for pre-service teachers and in-service ones that integrating video games found to be a time consuming process (Ertzberger, 2008; Huang & Huang, 2015; Topçu et al., 2014). To learn and make work such a new technology requires a lot of time and effort with the heavy workload they are under (Becker, 2007; Can & Cagiltay, 2006; Kebritchi, 2010).

Some teachers think the negative effects of gaming are superior to the learning opportunities it offers (Baek, 2008). Excessive competition, addiction, violence in the game content, and lack of classroom control can be counted as the perceived negative ways of game use in education (Kebritchi, 2010; Topçu et al., 2014). Some pre-service teachers state that not all the existing games were suitable for learning targets, objects, or subject matter (Sancar-Tokmak & Ozgelen, 2013). Also, some teachers think that video games limit the creativity of children although general creativity and video game play are found to be not related to each other (Hamlen, 2009).

Lastly, some in-service and pre-service teachers believe that school administrations would not like them integrating video games in the classroom (Becker, 2007; Ertzberger, 2008) while some of them believe that the administration would allow them (Bensiger, 2012).

2.3.1 Teachers as Game Creators

Although game based learning has been studied a lot, there are not so many studies in the literature that focused on enabling teachers to create their own games that will meet their own classroom's needs.

A study conducted by Romero & Barma (2015) focused on introducing pre-service teachers' to different Game Based Learning and Serious Games strategies as (1) using an existing educational game, (2) learning through a game creation activity, (3) repurposing a commercial game for educational purposes. Fifty-one pre-service teachers were asked to select one strategy to integrate GBL in the primary education.

Most of the participants preferred using an existing educational game rather than creating or repurposing one. According to the results, the avoidance reasons of customizing, adapting or creating a new game were the technological requirements of these activities.

Another study was conducted in Taiwan by Hsu, Liang, & Su (2014) in order to investigate the teachers' confidence in TPACK-G (Technological Pedagogical Content Knowledge – Games) and acceptance of game-based learning. The participants were 49 experienced in-service preschool teachers. The study had a quasi-experimental design where 24 participants assigned to technology-oriented group and the rest were assigned to the pedagogy-oriented group. Groups took the same courses but the order they were taught was different. The medium used for game development was Scratch (<http://scratch.mit.edu>). The data were collected through questionnaires. The results of this study indicated that the technology-oriented group outperformed the pedagogy-oriented one. The researchers suggest that teaching game knowledge before game pedagogical content knowledge while integrating a TPACK-G framework increased preschool teachers' competency higher.

A study was conducted by Li, Lemieux, Vandermeiden, & Nathoo (2013), and it aimed to examine pre-service teachers' experiences and perceptions of digital games after engaging in a game design process. They also investigated the pre-service teachers' 21st century skills. The participants consisted of 21 pre-service teachers. The web app Scratch was used as the game development platform. The results of this study showed that one did not have to be an expert in programming in order to utilize his/her own skills to create an instructional game. This proved that the instructor did not always have to know the answer. Additionally, the process allowed the pre-service teachers to discover their own creativity and confidence. Game design activities promoted the pre-service teachers' 21st century skills such as problem solving, communication and collaboration, critical thinking, technology literacy etc.

Sancar Tokmak & Ozgelen (2013) conducted a study in Turkey that focused on the perceptions of 26 pre-service teachers in the department of early childhood education. This study mainly focused on selecting and redesigning an educational computer game. The data collected through open ended questionnaires, interviews, participants' lesson plans, and the games they selected and re-designed. The results indicated that the pre-service teachers found it difficult to select an appropriate game to teach. They preferred to use educational games for assessment. The games helped pre-service teachers to take another perspective. Additionally, the pre-service teachers indicated that the games required students to have prior knowledge about the game and the content.

In another study, Frossard, Barajas, & Trifonova (2012) examined teachers' creativity in terms of the GBL design process, the GBL scenario, and the teaching processes. Twenty-one Spanish primary and secondary school teachers participated in their study. The teachers designed and implemented the games they created according to their own needs. The results indicated that the game design process promoted productivity and creativity of teachers. The time factor greatly affected creativity regarding the quality of the games created by the teachers and the implementation process. Another factor was collaboration that occurred among teachers. Additionally, game based learning activities appeared to have a positive impact on learning outcomes and motivation for both teachers and students.

Another study by Inal, Karakus, & Cagiltay (2008) was conducted in order to investigate pre-service teachers' educational game preferences. The participants were 46 pre-service teachers at the Department of Foreign Language Education. None of them were video game players. They were required to design a narratology-based educational game in the scope of this study. The results showed that the pre-service teachers mostly focused on vocabulary teaching through avatar-based games, and the stories were related to real life. It was concluded that narratology-based educational games might be suitable for foreign language education.

2.4 Summary of the Literature

The literature review focused on how game based learning holds place in the literature in terms of video games, mobile games, perceptions of teachers toward video games and integration in the classroom.

Recent research indicate the advantages of game based learning are generally superior to the disadvantages. The advantages can be ordered as concentration, motivation, enjoyment, learning by doing, collaborative learning through group activities and gaming communities. There are not so many studies in the literature that focused on enabling teachers to create their own games that will meet their own classroom needs. Teachers need to know how to adopt commercial games and benefit from their advantages in their own classroom settings. This can only be possible with increasing their awareness about the opportunities that video games provide to education.

As for mobile technologies, the mobile platforms have been preferred for casual gaming recently. Also, most of the students already own personal mobile devices. For this reason, enabling teachers to utilize mobile game-based learning strategies gains importance.

Aside from the advantages of game based learning, it is not easy to implement it to school settings. The research revealed some barriers to integrate video games in the classroom. Although some of the teachers think that games can be useful educational tools, they are not very successful at using them in their own classrooms because of their lack of game-based learning knowledge. This leads teachers to feel unconfident in their own class, and it also limits their capacity. To overcome this issue, the studies suggest that teachers should be familiarized with such new practices. Introducing teachers, especially pre-service teachers since they are the teachers of future classrooms, to game based learning practices will allow them to make use of existing games with relevant content as well as sorting their own game based learning content (De Grove, Bourgonjon, & Van Looy, 2012; Can & Cagiltay, 2006; Kenny & McDaniel, 2011). One possible solution can be including game based

learning focused courses into higher education of pre-service teachers (Razak et al., 2011). For future research and in order to gain further insight, what would happen if games were integrated into teacher-training activities should be examined (Kenny & McDaniel, 2011).

CHAPTER 3

METHODOLOGY

In this chapter, the methodology of the study is described. Research questions, overall design of the study, participants and sampling, context of the study, data collection instruments, data collection procedures, data analysis, role of the researcher, quality of the research, assumptions, limitations and delimitations of the study are explained in detail.

3.1 Research Questions

The purpose of this study is to investigate pre-service teachers' beliefs in integrating mobile games into teaching, and perceptions on the barriers and enablers in integrating mobile games into teaching after engaging in an educational mobile game design and development process. This study also explores pre-service teachers' experiences about mobile games. The main research questions driving this study are as follows:

- 1- What are pre-service teacher's beliefs in integrating mobile games into teaching?
- 2- What are pre-service teachers' perceptions on the enablers in integrating mobile games into teaching?
- 3- What are pre-service teachers' perceptions on the barriers in integrating mobile games into teaching?
- 4- What are pre-service teachers' experiences about mobile games?

3.2 Overall Design of the Study

In this study, a mixed methods research approach was followed. Mixed methods approach utilizes strategies that involve both quantitative and qualitative data collection either sequentially or simultaneously in order to understand the research problem (Creswell, 2003). While mixed methods research allows using both quantitative and qualitative approaches in a complementary manner and promotes the strengths of both approaches, it helps eliminate the weaknesses of each method (Fraenkel, Wallen, & Hyun, 2012). According to Johnson and Onwuegbuzie (1990), mixed methods research solutions answer many research questions to the best and fullest. A sequential explanatory design (Creswell, 2003; Creswell, Clark, Gutmann, & Hanson, 2007) was used in this study. Sequential explanatory design starts with a phase where quantitative data collection and analysis are carried out. A qualitative follow-up is conducted in order to assist in explaining, expanding, or interpreting the findings of the quantitative phase. The priority in sequential explanatory design is usually given to the quantitative data.

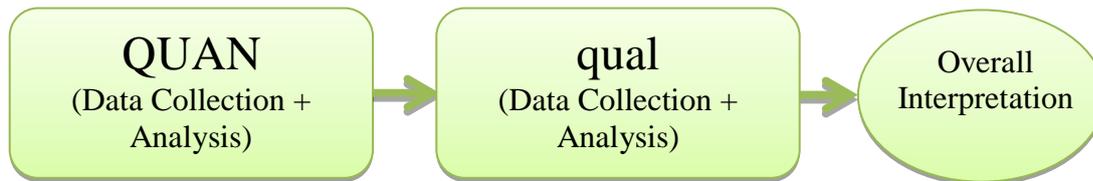


Figure 3.1 Presentation of Sequential Explanatory Design by Creswell & Plano-Clark (2011)

In this study, quantitative and qualitative data were collected sequentially. Figure 3.1 shows the visual presentation of the design that was used. Firstly, quantitative data were collected through a survey in order to investigate pre-service teachers' personal experiences about mobile games, their personal beliefs in integrating mobile games into an educational setting, and perceptions on the barriers to integrating mobile games into teaching after they were engaged in a mobile game design and development process. Secondly, semi-structured interviews were conducted with the participants as a follow up in order to go deeper and investigate the participants'

perceptions on educational mobile game use as well as barriers and enablers in integrating mobile games into teaching after engaging an educational mobile game design and development process. The quantitative data held the priority in this study. Integration of the two types of data was done in the interpretation phase. Additionally, the both sets of data were used for triangulation in order to achieve credibility of the research.

3.3 Participants of the Study

The participants of this study were 50 volunteered undergraduate students who were enrolled in “CEIT 422 – Educational Technology and New Media” and “CEIT 319 – Instructional Technology and Material Development” courses at Middle East Technical University (METU) in Spring Semester, 2015. Twenty-six (52%) of the total participants were in CEIT 319 course. Twenty-four (48%) of the total participants were in CEIT 422 course.

The participants represented a convenience sample for this study. According to Fraenkel et al.,(2012, p. 99), a convenience sample consists of the participants who are “conveniently available for the study”. The first reason why these participants were convenient to study with is that the courses CEIT 422 and CEIT 319 provided suitable content for this study. Mobile learning and game use in education were already addressed within the scope of CEIT 422 course. Moreover, CEIT 319 course had its content gamified by integrating core game elements. So, the students who took these two courses were familiar with the game concepts in general. Secondly, the courses selected were suitable for the implementation of this study. Both courses had laboratory sessions, during which the students could carry out mobile game design and development activities.

The participants were from different departments consisting of Computer Education and Instructional Technology (CEIT) (N=18 or 36%), Foreign Language Education (FLE) (N=4 or 8%), Elementary Science Education (ESE) (N=2 or 4%), and Early Childhood Education (ECE) (N=26 or 52%). The number of female participants was

37 (74%), and the number of male participants was 13 (26%). The participants were mainly juniors (N=38 or 76%). Seven (14%) of the participants were sophomore and 5 (10%) of the participants were senior. Table 3.1 shows the distribution of the participants by year of study and department. Participants' age ranged between 20 and 25 years old.

Table 3.1 Distribution of Participants by Gender and Year of Study

Pre-service Teachers		ECE	CEIT	FLE	ESE	Total
Freshman	N	-	-	-	-	-
	%	-	-	-	-	-
Sophomore	N	-	5	2	-	7
	%	-	10%	4%	-	14%
Junior	N	26	9	2	1	38
	%	52%	18%	4%	2%	76%
Senior	N	-	4	-	1	5
	%	-	8%	-	2%	10%
Total	N	26	18	4	2	50
	%	52%	36%	8%	4%	100%

As for the qualitative phase, 13 (26%) of the participants were selected to be interviewed. This selection was made purposively based on the mini-game submissions and the departments of the participants in two steps. According to purposive sampling method, the researcher selects the participants based on prior evidence that shows the participants have specific qualifications (Fraenkel et al., 2012, p. 100). This method draws its strength from information-rich cases which will illuminate the research questions of the study (Patton, 1990). The mini-game projects that the interviewees submitted represented good evidence in terms of identifying information-rich cases. As the first step of the purposive selection, from 27 (54%) of the total participants who completed the mini-game activity, the ones who successfully fused the educational content of their choice and game elements were chosen (N=17 or 34%). As the second step, 13 (26%) participants from different departments were selected from the 17 participants who were selected in the first step in order to allow any possible common patterns to emerge from the qualitative data.

The participants of the qualitative data collection phase consisted of 9 female (69.23%) and 4 male (30.77%) interviewees. Six (46.15%) of them were CEIT

students, while 3 (23.08%) were from ECE, 2 (15.38%) were from FLE, and 2 (15.38%) were from ESE departments. The ages of the participants ranged between 21 and 26. All of the interviewees play games. Eleven (84.62%) of them play games on mobile platforms at most such as smart phones or tablets while 7 (53.85%) of them plays games both on mobile and PC. Additionally, 1 (7.69%) participant plays on both PC and game consoles and 1 (7.69%) plays games only on PC. Majority of the interviewees (N=11 or 84.62%) learnt how to play games from their friends and the rest (N=2 or 15.38%) learnt it in the family. One of the participants (7.69%) had prior video game design and development experience. And only 1 (7.69%) had mobile application development experience before this course.

3.4 Context of the Study

The implementation of the study took place within the scope of CEIT 422 and CEIT 319 courses in the spring semester of 2014-2015.

3.4.1 Course Description

“CEIT 422 – Educational Technology and New Media” course is an elective course offered to all undergraduate students in Faculty of Education by the department of Computer Education and Instructional Technology. The course introduces to Internet and Web 2.0 technologies such as wiki, blog, podcasting, vBlogs, vidcasting, learning management systems, as well as mobile technologies, and their use and management in the educational aspect. The course took two lesson hours of theoretical lecture and two lesson hours of laboratory session each week. The students of this course in the spring semester of 2014-2015 were pre-service teachers from CEIT, ESE, and FLE departments. Students had to participate in the course activities, submit reflections, write a blog about lab activities each week, and create an educational mobile game to succeed the course. For the reason that mobile learning and game use in education were addressed within the scope of the course, the course was suitable for the implementation of the study.

“CEIT 319 – Instructional Design and Material Development” course is a service course offered to non-CEIT students in the Faculty of Education by the department of CEIT. The course underlines learning theories and how they are applied into development of instructional materials. All major types and formats of instructional media, such as visuals, audio, video, multimedia, computer-based, and online materials are addressed along with their preparation and assessment within the scope of the course. It took two lesson hours of theoretical lecture and two lesson hours of laboratory session each week. In the spring semester 2014-2015, the students enrolled in this course were all from the department of Early Childhood Education. As for this course, course content, assignments, and course activities were reorganized in a gamified manner by utilizing some major characteristics of games such as narratives, challenges, quests, collaboration, competition, leaderboards, badges, feedback, team play, boss challenge, etc. Therefore the students were already familiar with variety of game elements. So, it was convenient enough to integrate mobile game design and development activities into this course.

3.4.2 Implementation Process

Implementation of the study consisted of 3 weeks of lab sessions and an educational mobile game design and development activity (mini-game project). Developing mobile applications with MIT App Inventor 2 (AI2) was covered during the lab hours. The content of the lab activities was the same for the both courses. At the end of three weeks, the students were assigned with the mini-game project over which they would be graded. Creating this project was a part of the course requirements for CEIT 422 course. Differently, proceeding on to create this project after 3 weeks of lab sessions was on voluntary basis for CEIT 319 students.

The implementation process was partially piloted before this study. It is also explained below.

3.4.2.1 Laboratory Activities

The first week's lab activity had only an introductory purpose to MIT App Inventor 2. Basic elements of AI2 were explained. How AI2 is run and connected with an Android device for live-testing was covered. For the students who did not have access to an Android device, the emulator software was mentioned. Small app examples were also shown, so the students could gain a better understanding about AI2 structure. Students were asked to submit these examples onto the course learning management system (ODTUClass) until the next week's lab session. After the lab session, a guide document that covers all that had been done during the lab was provided to all students.

In the second week, the students who do not have an Android device were provided with Android tablets for live-testing. Four basic app examples were covered in this session. Each example underlined different AI2 components and events such as button, input box, Text-to-Speech converter, accelerometer sensor, canvas, dragging event. A detailed list of the components covered by week can be found in the Table 3.2 and Table 3.3. This week's lab activity had students create their first mobile applications and live-test them on mobile devices or the emulator tool. After the lab, the students were provided with video tutorials of the examples covered. Again, they were required to submit these four examples onto ODTUClass in three days and they were informed that another assignment would be given on the 4th day after the lab. The second assignment of the week was an assignment to create and submit before the next week's lab. The instructions for this assignment were clearly given on the website of MIT AI2. The assignment included new components that were not mentioned during the lab. However they were explained clearly in the instruction page. Students were always encouraged to mail the researcher and ask for support in case they needed further help.

The third week started going over the previous week's assignment quickly as that app contained a few new components. The common mistakes on assignments were underlined. Another similar app was created at this week's lab.

Table 3.2 Components Covered by Week at CEIT 422 Course

Hr	Weeks	Week 1 10.03.2015	Week 2 17.03.2015	Week 3 24.03.2015	Week 4 31.03.2015
CEIT 422 10:40 – 12:30	<ul style="list-style-type: none"> • Introduction to AI2 • Designer & Blocks editors • AI2-Mobile device connection • The emulator <p><u>Components & Blocks</u></p> <ul style="list-style-type: none"> • Textbox • Label • Button <p><u>Homework</u></p> <ul style="list-style-type: none"> • Submission of the example shown at the lab session. 	<p><u>Components & Blocks</u></p> <ul style="list-style-type: none"> • Text-to-Speech • Accelerometer Sensor • Canvas • Dragging event • Ball • Controlling colours by action • Horizontal & vertical arrangement <p><u>Homework</u></p> <ul style="list-style-type: none"> • Submission of examples shown at the lab. • Mole Mash app submission 	<ul style="list-style-type: none"> • Underlined the components in Mole Mash app • Applied Mole Mash2 app <p><u>Components & Blocks</u></p> <ul style="list-style-type: none"> • Image Sprite • Clock & Timer • Sound • Lists • Random fraction • Screen initialize commands • “For each” block • Variables • Procedures • Math calculations <p><u>Homework</u></p> <ul style="list-style-type: none"> • Finding an educational mobile game idea 	<ul style="list-style-type: none"> • Feedback session • Discussion of feasibility and convenience of students’ mobile game ideas 	<p>07.04.2015 - 14.04.2015 (2 Weeks time for students to finalize their projects)</p> <p>Deadline 21.04.2015 (Project Submissions)</p>

Again, the students were required to submit the app that was created at the lab onto ODTUClass. In addition, students were informed about mini-game projects. They were asked to try and come up with ideas for designing an educational mobile game, and e-mail them to the researcher until the next week. In order to help them come up with new ideas, they were provided with a document which underlines core elements that a game has, and how they could use their own daily life experience for the benefit of a mini-game inspiration.

During the lab hour of the following week (week 4), CEIT 422 students had a free time to talk about their mini-game ideas. They had a chance to discuss feasibility and convenience of their ideas with the researcher. This session did not include a collaborative activity. The researcher provided feedback and helped everyone separately.

As for the CEIT 319 course, only 3 students were volunteered to participate in the mini-game activity. No feedback session was carried out with them. However, they still had to receive the researcher’s approval until the Week 4. They were always in touch with the researcher via e-mail.

Table 3.3 Components Covered by Week at CEIT 319 Course

Hr	Weeks	Week 1 10.03.2015	Week 2 17.03.2015	Week 3 24.03.2015	Week 4 31.03.2015	07.04.2015 - 14.04.2015 (2 Weeks time for students to finalize their projects)
CEIT 319 14:40 – 16:30		<ul style="list-style-type: none"> • Introduction to AI2 • Designer & Blocks editor • AI2-Mobile device connection • The emulator <p><u>Components & Blocks</u></p> <ul style="list-style-type: none"> • Textbox • Label • Button <p><u>Homework</u></p> <ul style="list-style-type: none"> • Submission of the example shown at the lab session. 	<p><u>Components & Blocks</u></p> <ul style="list-style-type: none"> • Text-to-Speech • Accelerometer Sensor • Canvas • Dragging event • Ball • Controlling colours by action • Horizontal & vertical arrangement <p><u>Homework</u></p> <ul style="list-style-type: none"> • Submission of examples shown at the lab. • Mole Mash app submission 	<ul style="list-style-type: none"> • Underlined the components in Mole Mash app • Applied Mole Mash2 app <p><u>Components & Blocks</u></p> <ul style="list-style-type: none"> • Image Sprite • Clock & Timer • Sound • Lists • Random fraction • Screen initialize commands • “For each” block • Variables • Procedures • Math calculations <p><u>Homework</u></p> <ul style="list-style-type: none"> • Finding an educational mobile game idea 	<ul style="list-style-type: none"> • No lab activity • Last day to be a volunteer for participating in the mini-game activity. • Feedbacks for game ideas were provided to students via e-mail 	Deadline 21.04.2015 (Project Submissions)

The students had 2 weeks to finalize their mini-games after week 4. No further lab activity was carried out. However students were highly encouraged about contacting the researcher for help.

Two of the students (one from CEIT 422 course, the other one from CEIT 319 course) contacted the researcher for a face-to-face help. A meeting was arranged with them in the week 5. The researcher answered their questions and provided them with help and guidance they needed.

3.4.2.2 Mini-Game Projects

Mini-game project was the final step of the implementation process where the participants were required to design and develop a mobile game on AI2 environment. The mobile game had to have an educational purpose which was not too broad. The participants had two weeks to finalize their projects. The researcher was in touch with them via e-mail in order to guide them through the process and give them feedbacks.

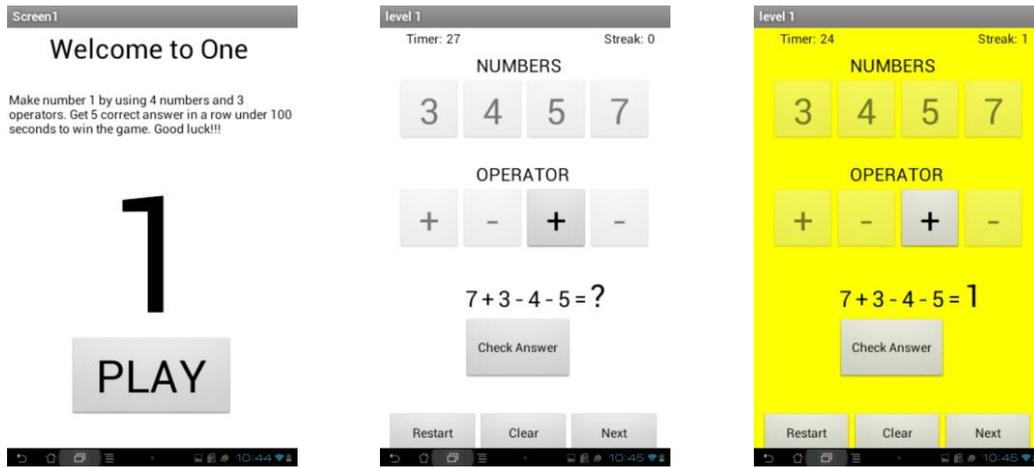


Figure 3.2 Screenshots of the Mini-Game “One”

The mini-game project aimed to make the pre-service students familiar with gaming concept and its educational use. It also aimed at enabling them to create the games that they could use in their future practice.

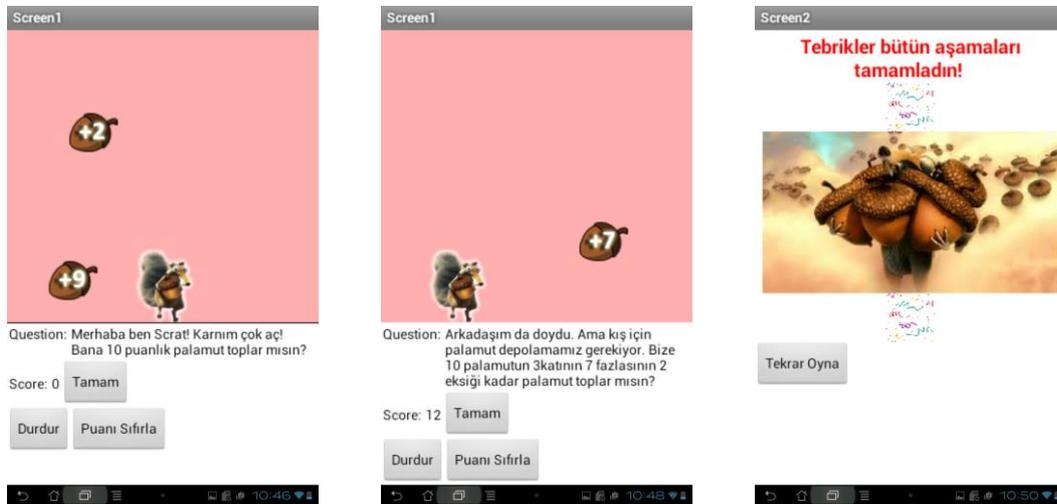


Figure 3.3 Screenshots of the Mini-Game “Feed Scrat”

In total, 27 students participated in the mini-game design and development activity. Figure 3.2, Figure 3.3 and Figure 3.4 show some examples of the participants' submitted mini-games. A list of Mini-Games that the participants submitted and their DOI links can be found in Appendix D.

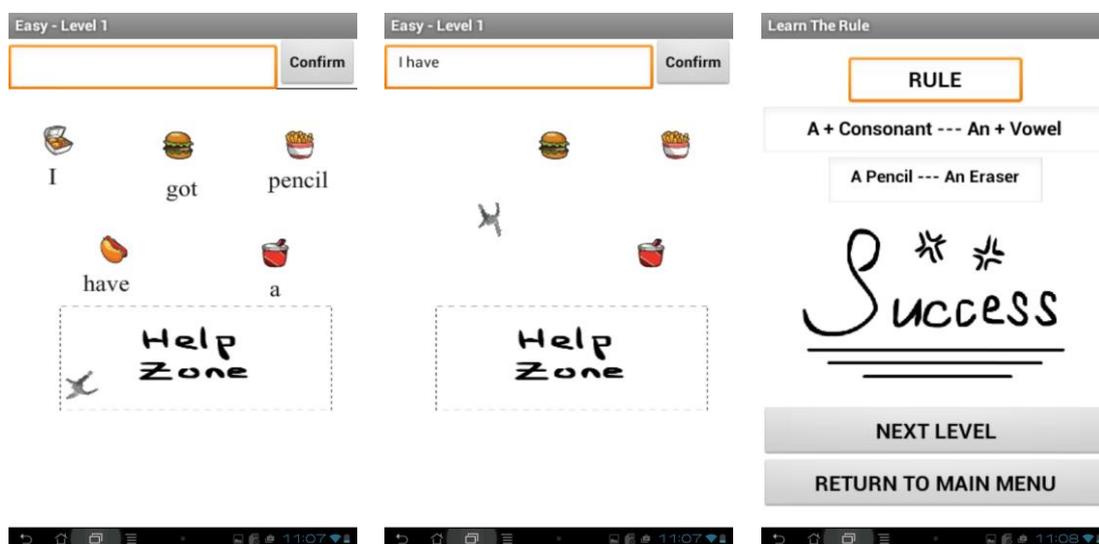


Figure 3.4 Screenshots of the Mini-Game “Yet Another Typing Game”

3.4.2.3 MIT App Inventor 2

MIT App Inventor 2 (AI2) is a programming tool which allows user to build applications for mobile devices that run an Android Operating System. It was first developed by a team which consisted of members from Massachusetts Institute of Technology and Google. Today it is administered by a staff at MIT’s Center for Mobile Learning still in collaboration with Google. AI2 seeks to reach out anyone who is interested in app creation and to make app creation accessible for them. Hence, it is completely free to use AI2. A wide range of resources and supporting documents are provided free on its official website. More resources are available in different formats on community forums, or video-sharing platforms such as

YouTube, on the Internet. The ease of accessibility of resources was one reason to have AI2 as the medium for this study.

The tool itself can be accessed at <http://ai2.appinventor.mit.edu>. It runs on a web browser and the data is stored on a cloud-based system where the user logs in using his/her Google account. Projects that are being worked on are saved simultaneously with the actions taken. Also, the tool is connected the Android device or an emulator software during the working process. Any action that has been made will be observed on the device or the emulator. This allows the user to live-test the app while working on it.

Unlike the traditional text-based programming languages, AI2 has a block based structure where all the user needs is to drag and drop ready-to-use code blocks. Blocks work like puzzle pieces. The blocks that can form a possible combination will fit together and be able to link with each other. If it is not possible to combine two kinds of blocks, then those blocks will not fit together.

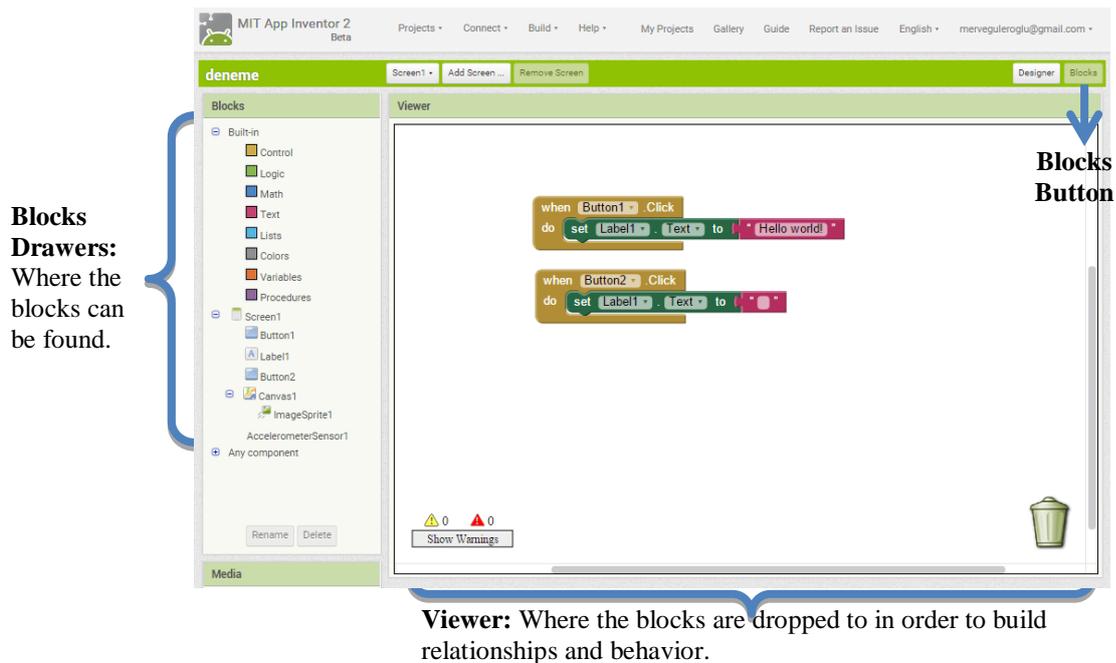


Figure 3.5 Blocks Editor Interface of MIT App Inventor 2

As for designing an app visually, AI2 has its Designer panel where the user can drag and drop the components he needs on the screen.

AI2 attracts attention of the people from various disciplines such as educators, government and civic employees and volunteers, researchers, hobbyists and entrepreneurs. The visual and block-based structure that AI2 has makes it possible for anyone to create mobile applications, even for the ones who do not have a programming or coding background (Y.-C. Hsu, Rice, & Dawley, 2012). For that reason, AI2 served as a good tool to for the students to create their own mobile games in such a short period of time.

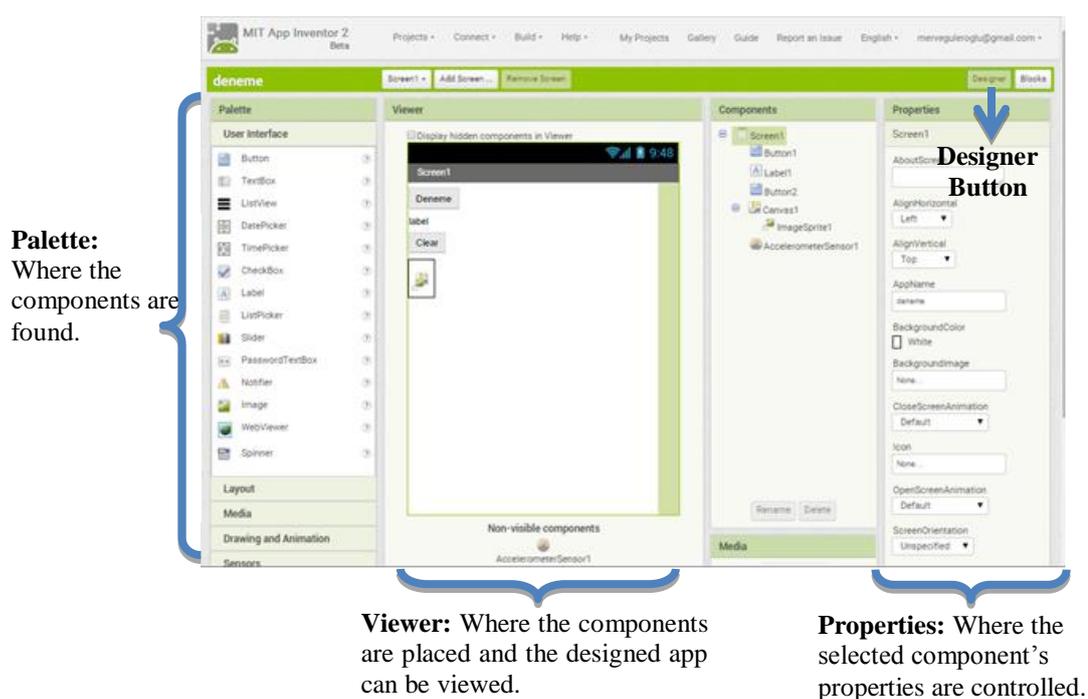


Figure 3.6 Designer Interface of MIT App Inventor 2

3.4.2.4 Pilot Study of the Implementation

In order to understand how pre-service teachers would perceive AI2 in terms of designing and developing their own games, a pilot study was conducted. This pilot study was a one-day activity as a short introduction to AI2 (the content of Week1 in the main study) and covered four basic examples (the content of the Week 2 in the

main study). This activity took about 3 lesson hours, and the researcher led the activity. Eight junior students from the department of FLE who were enrolled in CEIT 319 course in fall semester of 2014-2015 volunteered to participate in this pilot study. The participants consisted of 5 females (62.5%) and 3 males (37.5%) who did not have any background experience in mobile application development or in game design and development. Five (62.5%) of the participants were 19 years old and the rest (N=3 or 37.5%) were 20 years old. Additionally, all of the participants owned an Android smartphone.

After the activity, a short semi-structured interview was conducted with each participant. The interview questions are provided in Appendix B. All of them were informed about the ethical concerns such as privacy and confidentiality of their answers and identities. The interviews were recorded as audio files with the permission of the participants.

The interview questions focused on the subjects' previous experience with mobile application development, their awareness of MIT AI2, how they evaluated AI2, their willingness to continue developing applications using AI2, their opinions about use of mobile applications in education and about the advantages of being capable of developing mobile applications based on their needs in their future profession, their evaluations of the activity, whether the activity satisfied their expectations, and their willingness to participate in a future activity.

The results of the interviews indicated that the participants did not have any previous experience with mobile application development, and they were not aware of MIT AI2. In response to how they evaluated AI2, the participants mentioned that AI is simple, user-friendly, easy to use, has practical use of drag and drop methods, has ready to use puzzle like blocks, is suitable for beginners, free of charge for everyone, easy to get used to using the program, enjoyable, saves time for development, enables creativity, good option for people who are not technology savvy. They mentioned the following weaknesses of AI2: the blocks might be limiting for advanced programmers, the tool does not support development of all kinds of apps, and the emulator use was problematic. As for the educational use of mobile

applications, most of the participants believe that it is fun, suitable for in or out of the classroom use, interesting than using text books and will be more commonly used in the future. They pointed out that the apps which support social interaction would be suitable for in-classroom use, as well as game-like applications with weekly leaderboards, and they added that the teacher should make sure that teacher-student interaction is not intercepted and students are not distracted by the apps. The participants think that being capable of creating their own applications based on their own needs is a privilege; it makes a difference between them and the other teachers who are not able to create their own apps, especially when there is no existing application on the market to fulfill their needs. They added that the app will be customizable so the teacher will have control over the app, the customized app can be more suitable for the tasks that the educator intends to set compared to the existing ones, also there will not be any copyright issues, and the app can be sold on the market. The participants stated that before starting the activity, they did not expect to be able to create applications easily and quickly because they did not have a technical background. All participants mentioned that they enjoyed the activity, would like to continue developing applications using AI2 and they would like to participate in a future activity.

During the activity, the researcher observed the participants. In the light of these observations, it can be said that the participants had positive impressions. They had no significant difficulty in creating the applications. They followed the instructions easily. They quickly performed any task given by the researcher. They enjoyed it throughout the activity. The emulator caused synchronization problems during the live testing of their applications. However, the participants easily managed to re-sync the emulator with AI2.

The participants stated that although AI2 itself is simple enough in general; all the design components and blocks may seem complicated at first without an instructor to guide them. They pointed out that once the instructor gave brief information, they became clear, and they get used to the blocks in shortly. They think that the human support is a need. So, the lab activities in the main study were designed based on

that. The participants were provided with guide materials that covered the current week's lab activity after each lab session.

Overall, the results of the pilot study indicated that MIT AI2 was a suitable tool which allowed participants to start building applications immediately, as well as allowing them to access the resources easily when they needed. In the light of the results of the pilot study, the content that should be covered in laboratory sessions of the main study was decided.

3.5 Data Collection Instruments

Based on the research design of the study, both quantitative and qualitative data were collected. A survey instrument was administered for the quantitative phase. As for the qualitative phase, an interview guide which was developed by the researcher was used. Detailed information about these two instruments is given in this section.

3.5.1 The Survey Instrument

The survey instrument administered in this study was developed by Bensiger (2012) in order to assess the perceptions of pre-service teachers regarding the use of video games for teaching. "Video game" was defined as "any kind of game that run or were played on personal computers, mobile devices such as smart phones or tablets, game consoles such as PlayStation, Nintendo Wii, or Xbox, etc., a virtual environment such as Second Life" (Bensiger, 2012, p. 89) for the study in which this survey instrument was developed. A copy of the used version of the survey can be found in Appendix A.

The survey originally consists of 38 items that use 5-point Likert scale (Strongly Disagree, SD = 1, Disagree, D = 2, Neutral, N = 3, Agree, A = 4, Strongly Agree, SA = 5). The survey itself divided into four sections to assess the perceptions of pre-service teachers in different aspects of video game use in education. In addition,

there is a 5th part that originally included 12 demographic information questions which were reduced down to 8 questions accordingly with the context of this study. Moreover, the section “Video game experience at work” which assesses how pre-service teachers think their gaming experience would be in their future working environment, in other words at schools. This section was not used in this study since it was not appropriate for the context of this study. Also the item “It is hard to get video games installed on my classroom computers.” was not used for the same reason.

“Personal experiences with video games” section aims to determine prior gaming experience of pre-service teachers in daily life including personal experience and their preference about friends and family members playing games. In other words, the participants are asked about their gaming habits. Also they are asked whether they prefer their family or friends playing games or not. This section has 10 items.

“Personal belief in implementing video games” section focuses on pre-service teacher’s willingness to implement video games in their future practice. In this section, the value the pre-service teachers give to video games is assessed. There are 10 items in this section.

“Barriers in integrating video games” section assesses issues and obstacles that pre-service teachers believe that they might possibly face if they used video games for teaching purposes. The section consisted of 10 items. Some of the issues and obstacles mentioned are school’s allowance, technical conditions, teacher’s workload, time requirements of video games, and financial conditions.

Minor modifications were done on the survey instrument accordingly with the context of this study. First of all, since “Video game” definition for this survey already covered “mobile games”, the “video game” phrase was replaced with “mobile game” throughout the entire survey except for 22nd and 23rd items which would lose meaning or did not need editing. In total, 27 items in the first three sections of the survey had “video game” phrase replaced with “mobile game”.

Secondly, the 5th section (demographic information) of the instrument was re-designed accordingly with the needs of the current study. Eight questions in total were asked to participants in order to gather their demographic information. The demographic items included were gender, department, age, year, video gaming background, gaming platform that used the most, prior video game design experience, and prior mobile application design experience.

3.5.2 Interview Guide

The qualitative phase of this study involved semi-structured interviews. The interview guide used for this purpose was developed by the researcher and focused on personal beliefs of pre-service teachers about using mobile games for education as well as their perceptions on the barriers and enablers in integrating mobile games into teaching after engaging an educational mobile game design and development process. The interview guide was revised by a subject matter expert and an experienced research assistant. Necessary probes and prompts were added and some of the questions were grouped together based on these revisions. Once the guide was finalized, the researcher asked an undergraduate student to revise the questions in order to ensure that the questions were clear to a participant's understanding.

The interview guide was consisted of introduction, interview questions, and closing parts. The introduction part was where the interview protocol was in. The aim of the interview, the number of the questions, how long the interview would take, the importance of sincerity of their responses, audio recording, privacy and confidentiality of their answers and identities were mentioned in the interview protocol part.

The second part of the interview guide consisted of 9 questions derived from the research questions of the study and the patterns that emerged from the quantitative phase. The first question aimed at the participant's opinions on how using educational mobile games would affect the education they will provide in the future.

The second and third questions focused on the enablers educational mobile games. The fourth and the fifth and the sixth questions investigated the participants' perception on easiness of educational mobile games as an enabler or a barrier. The seventh and the eighth questions focused on the perceptions of the participants about integrating educational mobile games into their classroom and teaching. The last question was about the possible barriers that the participants might face integrating educational mobile games in their future practice.

In the closing part of the interview guide, the participants were asked if they had anything further to add related to the overall study and they were thanked for their participation.

3.6 Data Collection Procedures

Any instrument administered and data collection procedures followed during this study was approved by the Middle East Technical University Human Subjects Ethical Committee (HSEC). The document of the approval can be found in Appendix E.

The implementation process took 6 weeks from the beginning of the first laboratory activity and the last submission date of mini-game projects. A week after all the activities were done and the mini-projects were submitted, data collection process started with the quantitative phase in April, 2015. The instrument "Perceptions of Pre-service Teachers in Using Video Games as One of Their Teaching Tools" was administered for that purpose. The participants were briefly informed about the study. Furthermore, the ethical concerns such as the privacy and confidentiality of the information they would provide, participation on voluntary basis, and that the data collection would not cause any physical or psychological harm were explained to them in detail. The voluntary students filled out and signed the informed consent forms which also explained what the study was about and what the ethical conditions were. Additionally, the participants were informed that they should fill out the items 22, 23 and 28 according to their own expectations about their future working

environment. The researcher had already made the survey ready to be filled on Google Forms. In total, 50 students were volunteered to participate in the study. So, these 50 participants filled out the survey online. Afterwards, the responses were exported to a spreadsheet.

A diagram that shows a summary of the data collection process can be found in Figure 3.7.



Figure 3.7 Summary of Data Collection Process

The qualitative phase of the study included semi-structured interviews. These interviews were conducted with 13 participants that completed and successfully submitted their mini-game projects. All the participants were informed again about the number of the questions, how long it would take the importance of sincereness of their responses, audio recording, privacy and confidentiality of their answers and identities beforehand. Since that the researcher had spent significant amount of time with them during the lab sessions, and that she guided the participants throughout the mini-game design and development process, the participants comfortably participated in the interviews. Each interview took approximately 15 to 20 minutes.

10 of these interviews were conducted face-to-face in May 2015 at the meeting room at the department of CEIT. The researcher had made it sure that the room would provide a comfortable and a quiet environment that is suitable for the purpose. As for these 10 interviews, audio recording was used with the approval of the participants. The rest 3 interviews were conducted through e-mail in June 2015. The researcher

sent the document that includes the questions and the guideline to the participants, and the participants sent the document back after responding all the questions in detail. Additionally, the participants stayed in touch with the researcher in case of any further questions that the researcher might have to ask.

3.7 Data Analysis

Data analysis of this study was done in two phases. The first phase was the quantitative data analysis and it was done after the quantitative data collection process was completed. The quantitative data (survey responses) were collected using Google Forms which stores the responses in a spreadsheet. The entire data were imported to the statistics analysis software (IBM SPSS Statistics 20.0) for analysis. Afterwards, mean, standard deviation, frequency and percentage of the responses were calculated.

As for analyzing the qualitative data, content analysis was performed. As Creswell, (2012) suggested, the data were organized and prepared for analysis by transcribing the audio recordings to text first. All 13 interviews were transcribed by the researcher herself. After making sure the recordings were transcribed without any data loss, the coding was performed with a researcher who was experienced in content analysis. Codes were carefully designated and discussed over until a mutual agreement is reached. Once the coding process was done, similar ones were grouped and then the themes were drawn out of the codes. All the themes and codes were entered on a spreadsheet on computer in order to see all of them and be able to compare easily. The findings were reported as a narrative discussion (Creswell, 2012) in the results section. A list of the codes that emerged from this study can be found in the Appendix C.

3.8 Role of the Researcher

The researcher was responsible for carrying out the laboratory activities for both CEIT 422 and CEIT 319 courses during the implementation of the study. This included organizing 3 weeks of content to teach, preparing guide documents for students, organizing homework activities, uploading any sort of sources on ODTUClass, presenting the content at the lab sessions, evaluating students' homework, guiding the students throughout the entire process, and evaluating students' mini-game projects.

3.9 Quality of the Research

According to Fraenkel et al., (2012, p. 458) validity refers to “appropriateness, meaningfulness, and usefulness of the inferences researchers make based specifically on the data they collect”. As for reliability, it refers to “consistency of these inferences over time, location, and circumstances”.

Reliability of the quantitative instrument was ensured through measuring internal consistency. Cronbach's alpha coefficient value is recommended to be .7 and above (Kline, 1999 as cited in Field, 2009). In the present study, Cronbach's alpha coefficient values were found .70, .70 and .80 respectively. These values showed acceptable reliability values.

Content validity of the quantitative instrument was ensured through getting the survey reviewed by an expert and 2 undergraduate students. It was important for this study to ask undergraduate students to review the survey for the following reasons: (1) In order to make sure that the items were clear to the participants (2) to make sure that the format of the survey was suitable. Based on the feedback that the expert and undergraduate students provided, explanations were added to each section of the survey.

For the qualitative phase of the study, *credibility* also gains importance in terms of instrument validity and reliability as well as internal validity (Creswell, 2012; Fraenkel et al., 2012). Since the qualitative methods are naturally based on the researcher's perspective, the researcher has to assure the credibility of the research through some strategies such as *triangulation* and *member checking*. Triangulation is basically to use different kinds of instruments to collect data (Fraenkel et al., 2012). In order to triangulate the data in this study, qualitative instrument was augmented with some questions in line with the quantitative survey instrument. As Fraenkel et al., (2012, p. 458) suggested, interviews were audio recorded in order to prevent the possible distortions due to selective forgetting. The audio recordings were carefully transcribed into text. The interviewees were asked to check up and approve their own transcribed interviews to make sure that the recordings were properly transcribed into text format and to maintain member checking. Additionally, the interviewees were also asked a few times to review the accuracy of the qualitative report.

3.10 Assumptions

- The participants filled out the survey honestly and carefully.
- The participants were honest and sincere answering the interview questions.
- The training that the participants were provided with was sufficient for them to design and develop an educational mobile game.
- The mini-game project that each participant uploaded on ODTUClass was designed and developed by the participant him/herself.
- The homework assignments and laboratory activities were sufficient for all of the participants to obtain a general opinion on the basics of a mobile game design and development process even if they did not create a mini-game.

3.11 Limitations

- The findings reported in this study were based on the pre-service teachers in CEIT, ECE, ESE, and FLE departments in Middle East Technical University.
- Due to the use of convenience sampling, the sample might not be the representative of the population.
- The self-reported measures of the participants were used as the data source in this study.
- The self-reported measures of the participants might make bias inevitable. Therefore, the findings must be evaluated carefully.
- The participants of this study were initiated in terms of game-based learning before any data collection was performed. This might have had an effect on the results of this study.
- Mini-game design and development activity was a requirement for CEIT 422 course while it was optional for the students who were enrolled in CEIT 319 course. This might have had an effect on the results of this study.
- Although all of the participants were through the mobile game design and development training, only 27 of them created a mini-game.
- The interview results are limited only to the participants who completed the mini-game design and development activity.
- Total number of the participants may not be enough for a survey study.

CHAPTER 4

RESULTS

In this chapter, the results obtained from the study are presented. The results are categorized according to the research questions and explained in detail as follows:

- Pre-service Teachers' Beliefs in Integrating Mobile Games
- Pre-service Teachers' Perceptions on the Enablers to Integrating Mobile games to Teaching
- Pre-service Teachers' Perceptions on the Barriers to Integrating Mobile games to Teaching
- Pre-service Teachers' Experiences about Mobile Games

4.1 Pre-service Teachers' Beliefs in Integrating Mobile Games into Teaching (R.Q. 1)

In the survey, the participants were asked about their beliefs in integrating mobile games to their teaching. The results can be found in Table 4.1.

Table 4.1 Personal Belief in Integrating Mobile Games

#	Item	SD	D	N	A	SA	M	SD
11	Integrating mobile games in the classroom is important.	f %	-	1 2%	11 22%	33 66%	5 10%	3.84 0.62
12	I believe the use of mobile games in the classroom will increase the students' engagement.	f %	-	2 4%	12 24%	24 48%	12 24%	3.92 0.80

Table 4.1 Personal Belief in Integrating Mobile Games (Continued)

13	I value the use of mobile games in teaching.	f	-	1	14	26	9	3.86	0.73
		%	-	2%	28%	52%	18%		
14	I believe in the use of mobile game in the classroom to enhance my teaching ability.	f	-	1	17	23	9	3.80	0.76
		%	-	2%	14%	46%	18%		
15	I can expand my teaching skills by using mobile games in the classroom.	f	-	1	20	22	7	3.70	0.74
		%	-	2%	40%	44%	14%		
16	The percentage of my colleagues and students use mobile games is high (use on daily basis).	f	-	6	14	24	6	3.60	0.86
		%	-	12%	28%	48%	12%		
17	I play mobile games to relieve tension or stress.	f	-	6	12	22	10	3.72	0.93
		%	-	12%	24%	44%	20%		
18	When I play mobile games I get tension or stress.	f	2	13	20	11	4	3.04	0.99
		%	4%	26%	40%	22%	8%		
19	I believe that even when mobile games do not provide learning experience it is important in the classroom.	f	-	8	23	19	-	3.22	0.71
		%	-	16%	46%	38%	-		
20	I believe that mobile games could enhance the learning experience of the students.	f	1	1	21	24	3	3.54	0.73
		%	2%	2%	42%	48%	6%		

The results showed that a vast majority of the participants (N=38 or 76%) find integrating mobile games in the classroom important and they (N= 36 or 72%) believe that the use of mobile games in the classroom will increase student engagement. They (N=35 or 70%) also stated that they value the use of mobile games in teaching. Moreover, 64% (N=32) of the participants believe in the use of

mobile games in the classroom to enhance their teaching ability. They (N=29 or 58%) also stated that they can expand their teaching skills by using mobile games in the classroom. Majority of the participants (N=30 or 60%) think that the percentage of their colleagues and students use mobile games on a daily basis is high. The participants (N=32 or 64%) mainly play mobile games to relieve tension or stress. Nearly half of the participants (N=23 or 46%) remained neutral on the statement that they believe even when mobile games do not provide learning experience, it is important in the classroom, while they (N=27 or 54%) believe that mobile games could enhance the learning experience of the students.

The interview results also showed that the pre-service teachers' personal beliefs in integrating mobile games to teaching fell into three categories as (1) pre-service teachers' intended usage of mobile games, (2) benefits of mobile games to students, (3) considerations for use.

4.1.1 Pre-service Teachers' Intended Usage of Mobile Games

According to the interview results, pre-service teachers have intention to use mobile games in their future practice. Three themes emerged from the interview results in that sense as usage (1) as an instructional material, (2) as an instructional strategy, and (3) other intended usage.

As an Instructional Material

The participants have different ideas and opinions of using mobile games as an instructional material. Five codes emerged from their intended usage as an instructional material as (1) for teaching concepts, (2) as supplementary material for reinforcement, (3) as the main instructional material, (4) as homework assignment, and (5) as after class activity.

For Teaching Concepts: The participants (n=6) stated that using mobile games to teach concepts would be helpful to them. They pointed out that mobile games could especially help them visualizing abstract concepts such as computer viruses in computer education or area calculations in geometry. One of them stated:

“When teaching the letters, a field measurement formula or so to children, we could use shapes to decorate the game to make learning easier for them.”

“Harfleri öğretirken çocuklara, matematikte bir alanın formülünü öğretirken, alan hesaplamayı öğretirken, şekillerle falan daha yardımcı olacak şekilde oyunu süsleyebiliriz.” [Participant 10]

Another one stated:

“It is not easy to teach especially younger children about virtual concepts. ... But when you tell about them supported by an application or a game, it becomes tangible and kids get the concept better.”

“Sanal şeyleri özellikle, küçük yaştaki çocuklara anlatmak zor oluyor. ... Ama bunu bir uygulama ile ya da bir oyun ile anlattığımız zaman bu onlar için daha somut hale geldiğinden daha iyi anlıyorlar.” [Participant 2]

As Supplementary Material for Reinforcement: A vast majority of the participants (n=10) stated that mobile games could be used as a supplementary material after the main instruction was completed by the teacher. They especially pointed out that mobile games could be used for reinforcement. They explained:

“If kids get bored doing the exercises given after a subject, you can use games to complete the consolidation process.”

“Bir sınıftaki öğrenciler konuyu anladıktan sonra verdiğiniz alıştırmalardan sıkılıyorsa burada pekiştirme aşamasını başarıyla tamamlamak için oyunları kullanabilirsiniz.” [Participant 11]

“Subjects memorized get forgotten easily but I think it would be better if we use such an application for consolidation. For example, when it is time to do exercises after teaching a subject, they can play a game designed by me to understand better.”

“Ezberlenen dersler çok çabuk da unutuluyor ama böyle bir uygulama ile pekiştirilince daha güzel olabileceğini düşünüyorum. ... Mesela bir konuyu önce anlatıp sonrasında uygulamaya geçtiğimizde, benim hazırladığım bir oyun üzerinden o oyunu oynayarak öğrenebilirler.” [Participant 5]

As Main Instructional Material: The interview results indicated that the participants (n=7) believed that the mobile games were not suitable for use as a main instructional material. The participants found mobile games limited for teaching the entire lecture compared to traditional teaching strategies. One stated:

“I do not think that it is a good idea to have it for presentation / instruction part of the course. Because education occurs between living beings. ... It makes more sense if the teacher could show it once, then serve the game as an activity, while it is actually a second instruction / support.”

“Dersin presentation / instruction kısmının tamamında olması iyi değil bence. Çünkü eğitim biraz canlı varlıklar arasında olan bir şey yani. ... Hoca bir kez gösterir, sonra oyunu aktivite gibi sunup aslında onun ikinci bir instruction, destek olması daha mantıklı.” [Participant 4]

As Homework Assignment: Three participants stated that mobile games could be used as homework. They stated:

“If I am using it for the course, I could give an assignment to the students that they should get to level 10 until Monday.”

“...Dersle ilgili kullanacaksam diyebileceğim en iyi şey sanırım, pazartesiye kadar herkes 10. bölüme kadar gelsin, gibi ev ödevi vermek olurdu.” [Participant 11]

“It can be a homework activity for the student.” [Participant 6]

As After Class Activity: Three participants expressed that mobile games could be used outside of the classroom. One of them also added that an after-class activity

could be arranged for the ones who would like to learn how to create games. One of them stated:

“It can be a good option to learn English outside the class as well.”

“İngilizce öğrenmek için ders dışında da iyi bir seçenek olabilir.” [Participant 11]

Another one expressed:

“With those who are interested, they can come on weekends to learn how to create mobile games.” [Participant 6]

As an Instructional Strategy

Participants also indicated that mobile games can be utilized in the classroom as an instructional strategy. Four codes emerged as (1) grabbing student’s attention, (2) narrative game based learning, (3) teaching programming through game design, and (4) supporting kids with special needs.

Grabbing Student’s Attention: Majority of the participants (n=8) stated that mobile games would be a good means to grab student’s attention. Mobile games can be used for this purpose either at the beginning of the class, or for re-gaining students’ attention anytime during the class when they got distracted or bored. One participant pointed out:

“Draws the students’ attention to the class and this is an important stage.”

“Öğrencilerin derse ilgisini çeker ve onların ilgisini çekmek önemli bir aşama.”

[Participant 8]

Another one stated:

“Students get distracted when they are bored. ... [Thanks to games] I may be able to grab their attention back without any difficulty.”

“Dersten sıkıldım diyen öğrenciler, dikkatleri başka yönlere dağılıyor. ... [Oyun sayesinde] tekrar çabaya girmeme gerek kalmayabilir hani öğrencilerin dikkatini toparlayabilmek için.” [Participant 10]

Another one said:

“When students are bored and lost their focus during the class, it can be use for grabbing their attention again.”

“Öğrencilerin ders sırasında sıkıldığı ve konsantrasyonlarının düştüğü anlarda, onların tekrar ilgisini toplamak için kullanılabilir.” [Participant 13]

Narrative Game-Based Learning: Two participants mentioned that games could be utilized in a narrative game-based learning manner. Both participants were from the department of Early Childhood Education and they explained that stories could be told through games for their target audience. One participant specifically pointed out that the narrative game might not be individually played by each student but it could be shown to the entire class by using a projector. It was stated:

“Maybe to tell a story, we can deliver it through a game. Maybe not as a single game, but we can tell the story while we play it on the projector.”

“Belki bi hikâye anlatacağımız zaman hikayeyi bile oyun şeklinde anlatabiliriz. Yani tek kişi değil de bir sinevizyonda o oyunu oynarken, oradan bir hikaye anlatabiliriz.” [Participant 1]

“I would use it to promote brainstorming by asking them ‘There is a game in which the kids do it this way. What would you do if you were that kid?’ ”

“Böyle bir oyun var, burada çocuklar böyle yapıyor, siz olsanız ne yapardınız? Falan gibi brainstorming yapmak için kullanırdım.” [Participant 9]

Teaching Programming through Game Design: Three participants stated that they would teach programming through designing mobile games. One participant stated:

“I can show them how to create mobile games, maybe I can show them my mobile game and then I will ask them if any student is interested in learning it.” [Participant 6]

Another one stated:

“Coding can be taught through [game] coding. ... How to design a game could be taught. Especially because our department is computer [teaching].”

“Yine hani, kodlama [oyun] kodlama ile öğretilir. ... Oyun nasıl tasarlanır, öğretilir. Özellikle bizim bilgisayar alanı olduğu için.” [Participant 5]

Supporting Children with Special Needs: Only one participant mentioned that mobile games would be a good means to support the kids with special needs such as the ones with autism as well as the intellectually gifted children. The participant explained:

“I especially would like to improve myself about gifted children education, and since I cannot separate gifted children and technology, mobile games can be an important part of the education I will deliver. ... It can help about the inclusive education. It can be the kids with autism, or other kids with special needs. ... It could be used for grabbing attention of hyperactive kids.”

“Ben özellikle üstün zekâlılar alanında ilerlemek istiyorum mezun olduktan sonra ve üstün zekâlılarla teknolojiyi ayrı tutamayacağım için mobil oyunlar ileride vereceğim eğitimin büyük parçasını oluşturabilirler. ... Kaynaştırma eğitimi verilirken destek olabilir. Otizmli çocuklar olabilir ya da başka özel eğitime ihtiyaç duyan çocuklar için olabilir. ... Ya da hiperaktif bir çocuğun dikkatini daha çok çekebilmek, diğer çocukların etkinliğini dağıtmaması için kullanılabilir.” [Participant 1]

Other Intended Usage

The qualitative analysis revealed two codes as (1) assessment, and (2) helping / supporting other teachers for the pre-service teachers intended usage of games. The two codes grouped under other intended usage theme.

Assessment: Four pre-service teachers stated that they would use games for assessment. They explain:

“I would use it to assess whether the training reached the student properly. I would use it for evaluation.”

“Bir şeyi öğrettikten sonra, dersi anlattıktan sonra bu kazanımlar doğru ulaşıp mı öğrenciye diye evaluation yapmak açısından kullanırdım. Değerlendirme gibi kullanırdım.” [Participant 9]

“I could make a pop-quiz without they realize, as if they are racing in a technological environment. When they know that they will be graded from it, then they would be more willing to do it.”

“Aslında pop-quiz'i fark ettirmeden şey yapabilirim yani, onların arasında bir yarış gibi teknolojik ortamda yapabilirim oyunla. Bundan grade / not alacaklarını öğrendiklerinde hani daha çok istek duyacaklar.” [Participant 4]

Helping / Supporting other Teachers: Two participants mentioned that they would help and support other teachers to integrate mobile games into teaching. One of them stated:

“Maybe I will help other teachers to use my games too. As you know, I created a mathematics game. I can give it to other teachers to use it at their class as an activity.” [Participant 6]

The other one expressed:

“I believe that the reaction will be good [at the school I work]. They might even ask for my help to design a game for them. And I would help them.”

“[Çalıştığım okulda] tepkilerin güzel olacağını düşünüyorum. Hatta yardım bile isteyebilirler. Hani bize şöyle bir oyun tasarlasan, biz de derste kullansak gibi bir şeyler diyebilirler. Ben de onlara yardımcı olurum.” [Participant 5]

4.1.2 Benefits to Student

The interview results revealed that according to the participants, mobile games had some benefits to student. Eight codes emerged pertaining to the benefits of mobile games to students as (1) increasing academic achievement, (2) maintaining retention, (3) providing efficient learning, (4) making learning fun, (5) motivating, (6) drawing interest, (7) engaging, and (8) transforming students' negative beliefs.

Increasing Academic Achievement: The pre-service teachers (n=3) stated that mobile games could increase students' academic achievement since the games affect their learning positively and engage them. One participant explained:

“Without an educational game, some of the students are participating in the class actively, but some of them do not. But if we develop a game, I think it will be good for the success of that class because all the students will have to participate.”

“Eğitsel bir oyun olmadan, öğrencilerin kimi mesela derse aktif olarak katılıyor kimi katılmıyor. Ancak bir oyun geliştirdiğimizde, tüm öğrenciler oyun içine dahil olacağımızdan dolayı bu durumun ders başarısını artıracaklarını düşünüyorum.”
[Participant 10]

Another one stated:

“I think students can learn easier, because it will affect their learning. Their grades might improve.”

“Öğrencilerin bence öğrenmelerini etkileyeceği için belki bir konuyu daha kolay öğrenebilirler. Belki notları yükselebilir.” [Participant 2]

Maintaining Retention: The participants (n=4) stated that using mobile games for teaching would allow students to retain the knowledge they obtained. One participant said:

Maybe the students can internalise the subject better when they learn from the games and remember them more easily.”

“[Öğrenciler] Oyunla öğrendikleri zaman daha iyi içselleştirebilirler belki, daha iyi hatırlayabilirler.” [Participant 9]

Another one expressed:

“Considering the fact that students get more succesful when they do and learn by themselves, it will increase the retention and the product will be much better.”

“Öğrencilerin de kendi başlarına yaparak ve öğrenerek daha başarılı hale geldiklerini göz önünde bulundurursak hem öğrenilen bilginin kalıcılığı artar hem de ortaya çıkan ürün daha kaliteli bir hal alır.” [Participant 11]

Providing Efficient Learning: Five participants stated that mobile games would provide efficient learning. One of them stated:

“Everyone in the world played Candy Crush, right? The learning could be much more efficient if it involved such a fun but educating game, and if students competed with each other in the class.”

“Candy Crush'ı bütün dünya oynadı değil mi? Buna benzer eğlenceli ama işte ders içerikli bir oyun olsa ve sınıfın içinde öğrenciler birbirleriyle yarışsalar çok daha etkili olur öğrenme.” [Participant 4]

Another one said:

“I think it (learning with a game) would be more efficient and permanent. I really think that what I do will be much better compared to the classical learning.”

“[Oyunla öğrenme] daha efektif olur, daha böyle unutmaz, kalıcı olur. Birçok yönden klasik dersten daha faydalı olacağını düşünüyorum yaptığım şeyin.” [Participant 3]

Another one stated:

“If we provide learning with an educational game, they will learn how to use the technology while learning the subject more efficiently.”

“Eğitsel bir oyunla biz öğrenmeyi sağladığımız zaman, bir şekilde hem teknolojiyi kullanmayı öğrenmiş olacaklar hem de dersi de daha etkili bir şekilde öğrenmiş olacaklar.” [Participant 10]

Making Learning Fun: The participants (n=10) indicated that the mobile games allowed learning process to be fun. One participant said:

“People can while they are having fun. Looking from the viewpoint of education, providing learning through games could be the best way.”

“İnsan eğlendiği zaman bir şeyden öğreniyor. Böyle bir oyunun içine eğitsellik katıp bunu öğrenciye vermek belki en iyi yol eğitim açısından düşündüğümüzde bence.”
[Participant 3]

Another one stated:

“It could make the subject more fun. So it will contribute to the students’ learning process. It will help breaking the monotony of the class.”

“Daha eğlenceli hale getirebilir dersi. O yüzden öğrencini öğrenmesine daha çok katkıda bulunur. Dersin monoton olmasından kurtulmuş oluruz.” [Participant 5]

Motivating: Majority of the participants (n=9) indicated that the students would be more willing to attend to a game integrated course since games increased motivation. One of them mentioned:

“I can say that these kind of activities are a great motivation at the educational environment.”

“Bu tarz uygulamalar eğitim ortamında ciddi bir motivasyon kaynağı diyebilirim.”
[Participant 11]

Another one stated:

“To me, students should understand the subject, but without being bored of it. I would like my students to like the class, and be for motivated it. It (games) would contribute to that.”

“Bana göre, gerçekten bir konu anlaşılabilir ama onu yani gerçekten sıkıcı olarak anlamasınlar yani. Bir derse istekle gelsinler, sevgi duysunlar diye düşünüyorum. Ona çok katkı sağlar.” [Participant 4]

Drawing Interest: The pre-service teachers (n=3) stated that using mobile games for teaching would draw students’ interest to the course. One of them explained:

“Considering the current generation’s interest for mobile devices and activities, mobile gaming applications are really important to increase their interest for the course.”

“Günümüzdeki neslin mobil araçlara ve etkinliklere düşkünlüğü göz önünde bulundurulursa öğrencilerin derse karşı olan ilgilerini artırmak için mobil oyun uygulamaları gayet önemli.” [Participant 11]

Another one said:

“It is appropriate to use mobile games according to the age group of kids. These kind of things draw their attention anyway.”

“Çocukların yaş grubuna göre mobil oyun kullanmak uygundur. Zaten çocukların ilgisini çeker böyle şeyler.” [Participant 7]

Engaging: Seven participants point out that mobile games can engage student or increase engagement. One of them said:

“It can engage the student, I think.” [Participant 6]

Another one explained:

“Learning the class with these (mobile games) would increase student’s knowledge. Because they will be willing to participate more with educational games, they will be willing to be a part of the class.”

“Bunlarla [mobil oyunlarla] birlikte ders yapmak öğrencilere daha fazla birikim katacaktır. Çünkü daha fazla dahil olmak isteyecekler öğrenciler eğitsel oyunlarda, daha fazla dersin içinde olmak isteyecekler.” [Participant 10]

Transforming Student's Negative Beliefs: Only one participant mentioned that games could change student's negative beliefs towards the course or the subject. The participant explained:

“If the students think a subject as boring from the beginning or look reluctant about it, a game could be used to teach the subject or to create the impression that the subject is easier than it seemed. So the students' negative beliefs on the subject will be dealt with and their motivation will be increased.”

“Öğrenciler konuyu en başından sıkıcı buluyor veya isteksiz görünüyorlarsa yine konuyu anlatabilecek veya konu zor olsa bile öğrencilerde konunun kolay olduğu algısını yaratabilecek bir oyun kullanılabilir. Böylece hem öğrencilerin konu hakkındaki olumsuz görüşleri kalkacaktır hem de dersin geri kalan kısmında motivasyonları yüksek olacaktır.” [Participant 11]

4.1.3 Considerations for Use

The participants (n=11) indicated that mobile games should be used carefully. They specified the considerations that using mobile games required. Five codes emerged and grouped under this theme as (1) enhancing teacher's role, (2) student characteristics, (3) limiting social interaction, (4) flow state, and (5) unwanted outcomes.

Enhancing Teacher's Role: The participants (n=4) expressed that mobile game usage might seem to hinder teacher's activeness. They stated that it was important to enhance teacher's role while integrating mobile games into teaching. One of them stated:

“I think a game application might restrict what a teacher has to offer. ... A teacher cannot use all teaching techniques with games in every subject. I think game applications would cease teacher's role.”

“Öğretmenin verebileceklerini biraz kısıtlayabilir oyun uygulaması. ... Her tekniği oyunla birlikte kullanamaz öğretmen, her ders planında. Öğretmenin rolünü biraz daha azaltır bence oyun uygulaması.” [Participant 9]

Another one stated:

“Especially younger kids could focus on the game too much that they might forget about the teacher. I think, it is about the game content, too. If the game gives the teacher authority on some subjects and make the teacher more active, it will make the teacher involved more.”

“Özellikle küçük yaşta öğrenciler, daha fazla oyunun içine dalıp öğretmeni daha ikinci planda tutabilirler. Bu aslında biraz da yapılan oyunun içeriğiyle alakalı. Yapılan oyunda öğretmene biraz daha yetkiler verilse, öğretmen daha aktif olsa bu onu işine daha hâkim kılacaktır.” [Participant 10]

Student Characteristics: Four participants stated that student characteristics should be considered before integrating mobile game technology into the classroom as the students might have different backgrounds, their interaction with the mobile game would differ, or they might have different priorities related to their level. The participants stated:

“The kids who do not really have that much contact with the technology should be trained about it, at least at the beginning level. ... Even though everyone can success the language content (the teaching content) in a game, this does not mean that they will have the same playing success.”

“Günümüzde de halen daha teknolojiyle yok denecek kadar az temasta bulunan çocukların bu tarz uygulamalardan faydalanabilmeleri için giriş seviyesinde de olsa eğitim almaları gerekir. ... Sonuçta herkes bu tarz bir oyunda aynı dilsel başarıyı gösterse bile aynı oynayıp başarısını gösteremeyebilir.” [Participant 11]

“Not every student has an Android device. Some do not even have computers at their homes, or some never met the technology. You should first teach them about it then teach them how to play.”

“Her öğrenci androide sahip olmuyor. Evlerinde bilgisayar olmayanlar var. Ya da hiç tanışmamış olanlar var teknolojik cihazlarla. Bunları öğretip daha sonra oyuna gelmem gerekiyor.” [Participant 10]

“For elementary school, maybe it is suitable. But for high school, I do not think mobile games will be a trigger much. And we will have them in passing the university exam [Higher Education Examination - Undergraduate Placement Examination, Turkish: Yükseköğretime Geçiş Sınavı - Lisans Yerleştirme Sınavı (YGS - LYS)]. For elementary school, it is fine to teach them using mobile games but not for high school, because they have to focus more on solving tests.” [Participant 6]

Limiting Social Interaction: Majority of the participants (n=11) expressed their concerns about social interaction and mobile games. Since mobile devices are personal, the pre-service teachers think that using mobile games may hinder social interaction during the gameplay. They suggest that the games can be designed as multiplayer to prevent this from happening. They also state that playing games in a common context may lead the students to have discussions about the game afterwards which can eliminate the limited social interaction during gameplay. The participants stated:

“I do not think it will affect their social skills. If the kid is playing alone, I mean, if the kid will not work together with anyone else in the game, then he will not have any social interaction with anyone.”

“Sosyal becerilerine etkisi olacağını düşünmüyorum. Çünkü oyunda tek başında oynuyorsa çocuk, yani eğer birlikte hareket etmiyorlarsa o zaman herhangi bir sosyal iletişimi olmayacak kimseyle.” [Participant 8]

“The kid that played the game can share what he learnt from it with his friends.”

“Oyunu oynayan çocuk belki ordan öğrendiklerini arkadaşlarıyla paylaşabilir.”
[Participant 3]

“Maybe these games can be designed as multiplayer. This way, the kids can interact with their friends better.”

“Belki bu oyunlar tek kişilik değil de multiplayer olarak hazırlanabilir. Belki bu şekilde çocuklar arkadaşlarıyla daha iyi iletişim sağlayabilir.” [Participant 2]

Flow State: Three participants stated that they had concerns regarding the flow state the students might enter. One of them pointed out that the teacher could take advantage of this since a student would be fully engaged in the activity while in a flow state. However the participants stated the students might lose the sense that they are still in the class. The participants explained:

“Sometimes a kid can play a game for hours. He gets lost in the game not caring about anything else, isolated from the outside world. This could be good for focusing on the subject. However, depending on the content of the game, it should not make students lose interest for the class.”

“Bir oyuna çocuk oturduğunda saatlerce başında kalabiliyor. Ona dalıyor, başka bir şeyle ilgilenmiyor, tamamen etrafıyla iletişimini kesiyor. Bunun derse odaklanmak yönünden bana bir faydası olabilir. Hani yapılan oyunun içeriğine göre de böyle tamamen dersten koparmayacak şekilde tabi.” [Participant 10]

“During a game kids could lose themselves and show some excessive reactions when they win or lose. I think it could make the classroom management difficult for me.”

“Oyun sırasında çocuklar kendinden geçip kazandığında çok ani ya da kaybettiğinde çok ani sesli tepkiler verebilirler. Bu açıdan sınıf yönetiminde beni zorlayabilir.” [Participant 8]

“I believe, the kids might lost themselves into the game.”

“Çocuklar kendini çok kaptırırmiş gibi geliyor.” [Participant 1]

Unwanted Outcomes: Only one participant pointed out that the mobile game should be investigated thoroughly before serving in the classroom as a teaching material in order to prevent some possible unwanted outcomes. The participant explained:

“They cannot be used without having been researched. Because it is a kid we are talking about, a person who is open for learning. That means they will catch (what

they see) easily. If there is anything in the game that can even slightly affect the kid in a bad way, I will be responsible of that. ... Even if I prepare it all by myself, there could be things I overlooked.”

“Araştırma yapılmadan kullanılamaz. Çünkü bahsettiğimiz şey çocuk. Bahsettiğimiz şey öğrenmeye açık bir insan. Dolayısıyla çok çabuk kapacaklar ... Eğer oyunun içinde küçük de olsa farklı yönden çocuğu etkileyecek bir şey varsa bunun tek sorumlusu ben olurum. ... Kendim de hazırlıyor olsam hani bir şeyi gözden kaçırabilirim.” [Participant 3]

4.2 Pre-service Teachers’ Perceptions on the Enablers to Integrating Mobile Games into Teaching (R.Q. 2)

The qualitative data analysis revealed that pre-service teachers’ perceptions on the enablers in integrating mobile games into teaching differs in terms of using an already existing mobile game and creating a mobile game by themselves.

4.2.1 Enablers of Using Mobile Games

In terms of enablers using games 3 themes emerged from the codes that are drawn from the interviews as (1) benefits to teacher, (2) game related factors, and (3) other enablers. They are explained in detail below.

Benefits to Teacher

Benefits to teacher as enablers of using mobile games are stated by the pre-service teachers under 5 codes as (1) enhancing job performance, (2) promoting self-confidence, (3) saving time, (4), decreasing workload, and (5) creating good teacher image.

Enhancing Job Performance: Participants (n=3) stated that using mobile games in the class could help enhancing their job performance by saving their time and

allowing them to improve teaching strategies they employed. One of the participants stated that:

“It can improve my performance, but it is tiresome, too. Especially if I am going to prepare it. But if I am going to utilize something ready-to-use, it could increase my job performance.”

“Performansımı artırabilir de ama aynı zamanda yorucu da bir şey bence. Özellikle hazırlayacaksam ben, yorucu. Ama hazır bir şey kullanacaksam, o zaman artırıcı etkisi olur.” [Participant 8]

Another one stated:

“Since the mobile games will take less time than traditional activities, it could pave the way for new ideas. ... It will help the teacher improve his/her performance consistently.”

“[Mobil oyunlar] Geleneksel uygulamalara kıyasla daha az zamana mâl olacağı için daha yeni ve değişik fikirlerin de önünü açacaktır. ... Öğretmenin, performansını sürekli bir adım öteye taşımasının yolunu açar.” [Participant 11]

Promoting Self-Confidence: Participants (n=3) expressed that they believed using mobile games in the class would increase their self-confidence. One of them stated:

“(Using a mobile game) would improve me content-wise, make me feel self-confident. So I can answer kids’ questions more easily.”

“[Mobil oyun kullanmak] konu içeriği açısından beni geliştirir, kendime daha çok güven duymamı sağlar. Çocukların soracağı sorulara daha rahat cevap verebilirim böylelikle.” [Participant 7]

Another one expressed:

“Firstly, if I had used such a material (in school experience classes), would have caused students to interact with the game directly rather than interacting with me, and that would have reduced the pressure on me. Secondly, since it would improve the students, it would help me earn my self-confidence again.”

“Birincisi, [okul deneyimi dersinde] bu tarz bir materyal kullansaydım öğrenciler doğrudan oyunla etkileşime girecekleri için benim daha az iletişim kurmama yol açıp benim üstümdeki baskıyı kaldıracaktı. İkincisi, benim öğrencilerde görmek istediğim gelişimi sağlayacağı için ders esnasında benim kendime olan güvenimin geri gelmesini sağlayacaktı.” [Participant 11]

Saving Time: Seven participants mentioned that they found mobile games time saving. They stated that using mobile games would decrease the time spent on the theoretical phase of teaching. So, it would be possible to spare a longer time for the other learning activities, or the mobile game activity would substitute supplementary activities for learning. In other words, they think that using mobile games for teaching will speed up the learning process and this will more likely allow them to use it. One of the participants explained:

“If both activities (using a mobile game and not using it) will teach the same subject, preferring the one that requires less time will not only make students have more time for other parts of the education process but also prevent students’ from getting distracted before the activity.”

“Sonuçta iki tür etkinlik [mobil oyun kullanmak ve kullanmamak] de aynı bilgiyi öğretecekse daha az zaman alanın tercih edilmesi hem öğretim evrelerinin diğer bölümlerine daha fazla zaman bırakır hem de öğrencilerin etkinlik başlamadan önce dersten kopmamalarını sağlar.” [Participant 11]

Another one explained:

“If you use 30% of a 40 minute lesson for the theoretical education and the rest for the activity, it could be more efficient since it will shorten the time needed for the theoretical part and leave you more time for the activity.”

“40 dakikada anlatacağınız bir dersin, %30'unu teoriye ayırıp geriye kalan %70'ini de uygulamaya ayırıyorsanız, bu noktada belki oyun sizin teoriye ayırdığınız kısmı kısaltıp uygulamaya ayırdığınız kısmı artıracığından daha etkili olabilir.” [Participant 2]

Another one stated:

“I teach English in a kindergarten. I found a game which is on both platforms (Android and iOS). It teaches colors. I was going to teach that subject in 2-3 weeks with a lot of activities, but the game made things much easier. Instead of teaching it in three weeks, the colors were taught in just one lesson.”

“Ben anaokulunda İngilizce derslerine giriyorum. Bir oyun buldum ikisinde de [hem Android hem iOS cihazlarda] olan: Renkleri öğretiyor. Ben onu 2-3 haftada, bir sürü aktivite yaparak anlatacaktım. ... Çok kolay oldu mesela. Ben 3 haftada yapacakken, renkler olayı bir haftada kavrandı geçti.” [Participant 4]

Decreasing Workload: Participants (n=5) stated that using mobile games for teaching would decrease their workload in the classroom. They explain that especially if they use an already existing game, or plan the activity beforehand; using mobile games will ease workload in the classroom. One participant expressed:

“I think it is not a problem in terms of workload. It makes the teacher’s job much easier, because it is something the kids will enjoy, too. Especially if I am not the one to develop (the game) it will reduce my workload in the class.”

“Bence iş yükü bakımından engel değil. Tamamen kolaylaştırır öğretmenin işini mobil oyunlar, çocukların da severek yapacağı bir şey olduğu için. Özellikle [oyunu] kendim üretmeyeceksem iş yükünü azaltır sınıf içinde.” [Participant 9]

Another participant expressed:

“Using these applications will increase the workload for the teacher, because it requires planning as I told before, but it will reduce the workload in the class. The obstacles could be removed with pre-planning the activity.”

“Bu uygulamalardan yararlanmak, daha önce de dediğim gibi planlama gerektireceği için öğretmenin iş yükünü artıracaktır ama aynı zamanda da sınıf içindeki iş yükünü hafifletecektir. ... Ders öncesi bir planlamayla önündeki engeller kaldırılabilir.” [Participant 11]

Creating a Good Teacher Image: Two participants mentioned that using mobile games would allow them to be perceived as good teachers by the kids since mobile games were fun, and they provided different activities. One of them stated:

“Teaching the students through a different method, make them believe that I teach the subject better.”

“Öğrencilere farklı bir şekilde öğretmem, onlarda benim dersi daha iyi öğrettiğim kanısı oluşturur.” [Participant 13]

The other one stated:

“I could look like a very good teacher (when I use a game) for the kids have fun playing the game.”

“[Oyun kullandığım zaman] çok iyi bir öğretmen olarak görülebilirim. İşte, çocuklar çok eğleniyor oyun oynarken falan, böyle olabilir.” [Participant 9]

Game Related Factors

The qualitative data analysis showed that pre-service teachers declared some game related factors as enablers of using games. These factors are gathered under 3 codes as (1) ease of use, (2) availability of games on application stores, and (3) enjoyment.

Ease of Use: Participants (n=7) mention that mobile games are easy enough to use in the classroom for teaching purposes. One of them states:

“It is easy to use. I also think the student would prefer this learning method. It will be easier for teaching (the subject), too. Once you designed the material, you can use them in your classes, adding different things.”

“Kullanım kolay. Hem de öğrencinin isteyeceğini düşünüyorum böyle bir öğrenme şeklini. [Konuyu] anlatım açısından da kolay olur. Bir kez tasarladın mı kafanda, farklı konulara farklı şekilde, yeni şeyler ekleyerek çok kolay ilerlenebilir derslerde.” [Participant 5]

Another one expresses:

“We used similar applications in two courses at university this year. Those were the games that we played on smartphones. I think these kinds of games could be utilized easily by anyone.”

“Üniversitede bu dönem iki derste benzer uygulamalar kullandık ve bunlar da akıllı telefonlar aracılığıyla oynanan oyunlardı. Bu tarz oyunlar bence herkes tarafından kolaylıkla uygulanabilir.” [Participant 11]

Availability of Games on Application Stores: Seven participants stated that the games on the mobile application stores could be used for educational purposes. They expressed that the availability of appropriate mobile games would enable using mobile games in the classroom since it would be easier to use an already existing game compared to creating one. One of the participants stated that:

“Other than developing the game, if a teacher thinks a game is appropriate and it supports the subject to be taught, then other (already existing) mobile games could be used, too.”

“Onun [kendisi üretmek] dışında, eğer öğretmen herhangi bir oyunun uygun olduğuna karar verip oyun içinde derste ele alacağı konu hakkında yeterli destek bulabilirse diğer mobil oyunları da kullanabilir.” [Participant 11]

Another one expressed:

“If you check the AppStore and the other stores, there are many applications but most of them are not suitable or educational. But there are also some apps that are great, made for kids, aimed at educating them directly.”

“Baktığımız zaman AppStore'larda falan birçok uygulama var ama hepsi uygun değil, eğitsel değil. Ama içlerinde çok harika, hani böyle direkt çocuğu hedef alan, direkt öğretmeyi amaçlayanlar da var.” [Participant 3]

Another one stated:

“To use a mobile game in the classroom is easier if there is an already existing game, because I might have difficulties in creating one.”

“Sınıf içinde [mobil oyun] kullanmak, yani hali hazırda bir oyun varsa kolay olur. Çünkü üretme konusunda sıkıntılar yaşayabilirim.” [Participant 9]

Enjoyment: The participants (n=3) believe that mobile games are enjoyable to use in the classroom. One of them states:

“It would be not only a course that I enjoy giving but also a course that the students will not get bored of.”

“Hem benim açımdan girerken zevk alacağım hem de öğrencilerin sıkılmayacağı bir ders olur.” [Participant 5]

Another one states:

“There might be some difficulties, but I think it is still an enjoyable process to use mobile games.”

“Zorlukları falan olabilir ama bence zevkli bir süreç mobil oyunları kullanmak.” [Participant 10]

Other Enablers

The other codes that are emerged from the interview results are grouped as other enablers. There are four codes which are (1) Game Based Learning awareness, (2) personal interest, (3) intention to use, (4) student characteristics.

Game Based Learning (GBL) Awareness: GBL awareness is another factor that the content analysis revealed as an enabler to integrate mobile educational games into teaching. Some of the participants already had GBL awareness while some were unaware of GBL and its affordances before the course. The pre-service teachers (n=6) mentioned they were aware of GBL and it would enable them to integrate mobile games into teaching. One of them stated:

“I would not know that I had an option like this. ... Now that I know, I am aware of it, I will try to use it as much as I can.”

“Böyle bir seçeneğim olduğu benim aklıma gelmezdi. ... Şu an biliyorum, farkındayım ve mümkün olduğunca uygulamaya çalışırım, diye düşünüyorum bunu.”

[Participant 8]

Another one stated:

“Since I learn from games most of the time, I can guess what my students could learn from which parts, and how they can take advantage best of games. I would be more efficient using these applications and would not have any difficulties since I have already been through it.”

“Kendim de çoğunlukla oyunlar sayesinde öğrendiğim için öğrencilerin nerden neyi anlayabileceğini ve oyunlardan en yüksek verimi nasıl alabileceklerini büyük oranda tahmin edebileceğimden bu tarz uygulamaları kullanırsam hem daha verimli olabileceğimi hem de benzer süreçleri kendim de yaşadığım için çok zorlanmayacağımı tahmin ediyorum.” [Participant 11]

Personal Interest: Being interested in integration of game based learning applications and related technology was another factor that emerged from the interview results. Four participants mentioned that they are personally interested in integration of game based applications. One of them stated:

“I think especially because I have personal interest for this, while developing an application for the kids, I would prefer it as something more active, fun and making my job easier.”

“Özellikle sanırım benim ilgim olduğu için çocuklara bir şey yapacağım zaman çok daha aktif, eğlenceli ve hatta işimi kolaylaştıracak bir uygulama olarak tercih ederim.” [Participant 1]

Another one expressed:

“I am really interested in this subject. Game and learning together, it is good. So I would love it if mobile application usage in the education gets more popular.”

“Ben bu konuya çok ilgiliyim zaten. Oyun - öğrenme bir arada, güzel. Dolayısıyla çok isterim eğitimde mobil oyun kullanımının yaygınlaşmasını.” [Participant 3]

Intention to Use: Another enabling factor of using mobile games that emerged from the interview results was the participants' intention to use mobile games. Six of the participants declared that they intend to use mobile games in their future practice. One participant explained:

“Its feasibility in the class is important. Students should have equal opportunity. If I can have these, of course I want to use it. Mobile applications are beneficial for students in the class.”

“Sınıf içinde uygulanabilirliği önemli. Öğrencilerin eşit imkana sahip olması önemli. Tüm bunlara sahip olursam tabii ki kullanmak istiyorum. Çünkü büyük faydası var mobil oyunların derste öğrenciler için.” [Participant 10]

Student Characteristics: Since the students are target group for pre-service teachers' future profession, characteristics of students have importance. According to participants (n=8), students are already familiar with technology and mobil devices, so it will enable them to integrate mobile games into education easier. One participant stated that:

“Since it is the technology era today, the kids are more likely to learn through these devices.”

“Artık günümüz teknoloji çağı olduğu için artık çocuklar da böyle elektronik device'larla öğrenmeye daha eğilimli olmaya başladı.” [Participant 2]

Another one mentioned:

“The students are really good with the technology; they will not have any difficulty about it. It would be a way for them to learn and have fun at the same time.”

“Zaten öğrenciler teknolojiye hakimler, o konuda sıkıntı yaşamazlar. Hem eğlenip hem öğrenebilecekleri bir uygulama olur onlar için.” [Participant 8]

4.2.2 Enablers of Creating Mobile Games

The factors that enabled creating mobile games for teaching purposes were remarked by pre-service teachers during the interviews. These factors are grouped under two themes as (1) benefits to teacher, and (2) game design training.

Benefits to Teacher

According to the interview results, pre-service teachers think that creating mobile games for teaching have some benefits to teacher which can enable integration of mobile games. Five codes emerged from these benefits as (1) promoting self-productivity, (2) promoting self-creativity, (3) games tailored to needs, (4) increasing competency, and (5) extending point of view.

Promoting self productivity: Five participants mentioned that creating mobile games promoted their self-productivity alongside with some other factors such as self-creativity, and extending their point of view. One of the participants stated:

“If I am designing (the game) it would be great (for my productivity). I will have to use my creativity to design a game. It will make me see the matter from different angles and so make me more productive.”

“Eğer ki [oyunu] ben dizayn ediyorsam [üretkenliğimi] çok çok iyi etkiler. Yaratıcılığımı ortaya koyarak bir oyun tasarlamış olurum. Bir konuya farklı açılardan bakmamı sağlar ve böylece üretkenliğimi artırmış olur.” [Participant 8]

Another one stated:

“It makes me more productive. While designing the mini-game, I had a lot of different ideas. You find different ideas as you think about it.”

“Beni daha üretken yapar. Çünkü ben o oyunu tasarlarırken de zaten çok farklı farklı fikirler aklıma geldi. İnsan üzerinde düşündükçe daha farklı şeyler aklına geliyor.” [Participant 5]

Promoting self-creativity: The participants (n=4) mentioned that creating mobile games promoted their self-creativity. Although this code appears alongside with ‘*promoting self-productivity*’, it has a different meaning. The pre-service teachers use self-creativity as in coming up with original and different ideas to create a game. One of them expressed:

“I did this kind of games and game designing about English before. At first, it was hard for me but I can say I have gone a long way especially in the last two years. I do not have any difficulty finding new ideas.”

“İngilizce konusunda bu tarz oyunlarla ve oyun yapma işleriyle daha önce de uğraştım. İlk başlarda zorlanmıştım ama özellikle son iki yılda büyük yol aldım diyebilirim. Artık fikir bulma konusunda çok fazla sıkıntıya düşmüyorum diyebilirim.” [Participant 11]

Games Tailored to Needs: The participants (n=4) indicated that if they created their own mobile games, then they could design this teaching material specified to their classroom and needs. They explained that the mobile games of their self-creation would be tailored to the level of the class, and that would allow the teacher to utilize teaching strategies best fitting to his/her needs without remaining limited to the off-the-shelf games the others developed. One participant explained:

“I can design an application about the subject I am going to teach. I can use my own feedbacks, my own questions. It is harder to modify something than creating my own application with my own style and the appropriate level for my own students.”

“Kendi işleyeceğim konuya uygun bir uygulama hazırlayabilirim. Kendi istediğim feedback'ler, kendi istediğim sorular kullanabilirim. ... Hazır alınmış bir şeyi modifiye etmek daha zorken, kendim hazırlarsam kendi istediğim tarzda ve kendi öğrencilerimin seviyelerine uygun olarak hazırlayabilirim.” [Participant 2]

Another one stated:

“This way we do not have to use the off-the-self games. We can determine the current needs of the classroom and create games according to those needs. This is an advantage for us.”

“Sektördeki oyunları kullanmak zorunda kalmayıp, o esnada sınıfın bireysel ihtiyacını keşfedip ona göre oyunlar üretebiliriz yani, bu bizim için avantajlı olur.”

[Participant 1]

Increasing Competency: The interview results showed that creating mobile games made the pre-service teachers (n=7) more competent. The results also indicated that creating a mobile game required them to know the subject to detail. In this way, creating a mobile game increased their competency. One of the participants stated that:

“During the creation of the game, you have to know everything. Even if it is just a page, you really have to know it all. It is good for the teacher to brush up to try and create a game.”

“Oyun yaparken de her şeyi bilmen gerekiyor. Sadece bir sayfa yapıyor olsan bile her şeyini çok iyi bilmen gerekiyor. Öğretmenin bilgisini tekrar etmesi ve kalıcılaştırması için de bir öğretmenin oturup bir oyun yapmak için uğraşması iyi bir şey.” [Participant 4]

Another one stated:

“My department is computer education and the mobile game application that i will prepare is a technology-based activity. It would make me more competent in my job.”

“Bölümüm bilgisayar ve ben bilgisayar öğretmeni olacağım için ve bu hazırlayacağım uygulama [mobil oyun uygulaması] teknoloji tabanlı bir şey olduğu için, bu noktada beni işime daha hâkim kılar.” [Participant 2]

Extending Point of View: The participants (n=4) stated that creating games were of benefit to them in terms of extending their point of view. They explained that creating games allowed them to take a different perspective and have different approaches not only while creating a game, but also for their course-related work. One participant said:

“Thinking on it makes you come up with better ideas about it. Instead of seeing it from only one angle, I started thinking about how I could enrich the game, what I could add to improve it.”

“İnsan üzerinde düşündükçe daha farklı şeyler aklına gelebiliyor. Tek bir açıdan düşünmüyorsun da yani oyunda daha fazla nasıl zenginleştiririm, farklı bir şey nasıl katabilirim diye düşündüm.” [Participant 5]

Another one stated and added:

“Since it extended my point of view even now, I think the future activities in this structure.”

“Benim şu an bile ufku genişlettiği için, ben ileride de aktiviteleri hep bu mimaride düşünüyorum.” [Participant 3]

Game Design Training

Seven participants stated that creating a mobile game requires training beforehand. They mention this training requirement as an enabler to integrate mobile games into teaching rather than a barrier, since having this training would help them in creating mobile games. They stated that it would be easy for a teacher to acquire such training. Two of them added that they should be offered game design training at university. One of them expressed:

“It does not require a training especially if the teacher will use an already existing app. However, it requires training if the teacher will design his own game. I do not think this requirement will constitute a barrier. Some schools provide their teachers with such training through seminars. Other than that, if a teacher really wants to use it, he can learn it in his free time, especially during the summer time.”

“Özellikle hazır bir uygulamayı alıp kullanacaksa [eğitim] gerektirdiğini hiç düşünmüyorum ama öğretmen kendi dizayn edecekse gerektiriyor. Bence bu gereksinim engel olmaz. Yani öğretmenlere bazı okullar bu tarz eğitimler veriyorlar seminer kapsamında. Onun dışında öğretmen eğer gerçekten kullanmak istiyorsa boş zamanlarında, özellikle yazın, bu eğitimi alıp yapabilir bence.” [Participant 8]

Another one expressed:

“I think all the teachers must be taught coding, because everyone has to know about technology nowadays. ... It would be great if all the teachers could create games.”

“Bence öğretmenlik sınıflarına birazcık programlama göster, bütün öğretmenlere. Çünkü artık herkes teknolojiyle haşır neşir olmak zorunda. ... Herkes oyun yapabilse güzel olur.” [Participant 4]

4.3 Pre-service Teachers’ Perceptions on the Barriers to Integrating Mobile Games into Teaching (R.Q. 3)

In the survey, the participants were asked about their opinions on the barriers to integrating mobile games. The results of this part can be found in Table 4.2.

Table 4.2 Barriers to Integrating Mobile Games

#	Item		SD	D	N	A	SA	M	SD
21	Mobile games enhanced classroom needs more technical support.	f %	-	3 6%	15 30%	24 48%	8 16%	3.74	0.80
22	My organization allows me to install software applications based on my classroom needs.	f %	2 4%	2 4%	17 34%	27 54%	2 4%	3.50	0.81
23	My school allows me to get adequate training opportunities to learn new technology that could be used in the classroom.	f %	1 2%	2 4%	19 38%	23 46%	5 10%	3.58	0.81

Table 4.2 Barriers to Integrating Mobile Games (Continued)

24	It is too hard to identify the right mobile game for the students.	f %	-	4 8%	15 30%	28 56%	3 6%	3.60	0.73
25	Integrating mobile games would increase my workload.	f %	1 2%	4 8%	14 28%	28 56%	3 6%	3.53	0.81
26	Mobile game is time consuming.	f %	2 4%	11 22%	17 34%	19 38%	1 2%	3.12	0.92
27	If I use a mobile game, I may not be able to cover the given syllabus.	f %	-	11 22%	20 40%	16 32%	3 6%	3.22	0.86
28	I am comfortable in discussing with my supervisor about integrating mobile games in the classroom.	f %	-	2 4%	17 34%	28 56%	3 6%	3.64	0.66
29	More financial assistance from the government is needed to implement mobile games in the classroom.	f %	-	2 4%	15 30%	27 54%	6 12%	3.74	0.72

The results revealed that majority of the participants (N=32 or 64%) believe that mobile games enhanced classroom needs more technical support. The participants (N=29 or 58%) stated that their organization allows them to install software applications based on their classroom needs. 56% (N=28) of the participants agreed or strongly agreed on the statement that their school allows them to get adequate training opportunities to learn new technology that could be used in the classroom. Most of the participants (N=31 or 62%) find it too hard to identify the right mobile game for the students. 62% (N=31) of the participants think that integrating mobile games would increase their workload. Additionally, they (N=20 or 40%) find mobile games time consuming and they (N=19 or 38%) state that they may not be able to cover the given syllabus if they use a mobile game. Majority of the participants (N=31 or 62%) are comfortable in discussing with their supervisor about integrating mobile games in the classroom. 66% (N=33) of the participants believe that more

financial assistance from the government is needed to implement mobile games in the classroom.

In addition to the survey results, the interview results indicated that the barriers to integrating mobile games into teaching according to pre-service teachers fall into two groups as barriers to using mobile games, and barriers to creating games.

4.3.1 Barriers to Using Mobile Games

The participants declared the barriers to using mobile games during the interviews and three themes emerged as (1) external barriers, (2) barriers on the teacher's side, and (3) content appropriateness.

External Barriers

The factors that are out of teachers' hand are grouped under external barriers theme. There are five codes emerged from the interview results that fall under this theme. The five codes are as follows: (1) Learning environment, (2) technical issues, (3) school administration's attitude, (4) parents' attitude, (5) device diversity / compatibility.

Learning Environment: Nine participants mentioned that the issues related to the learning environment would be one of the major barriers to integrating mobile games into teaching. They pointed out that all the students might not be provided with mobile devices. They also express that some schools limit or ban the usage of students' personal mobile devices at the school. Participants stated:

“I think it is not quite possible considering the conditions now. Since the game will be based on Android and mobile, you have to use tablets, because we cannot give the kids phones.”

“Şu anki şartlarda, fiziki özelliklerde sanki biraz zor gibi. ... Olay Android tabanlı bir şey olduğu için, mobil bir uygulama olduğu için, olayın içine tablet girmesi gerekiyor. Hani telefon veremeyeceğimiz için...” [Participant 3]

“Also, about the schools, bringing technological devices to most schools is forbidden. In such schools, instead of playing the game individually by using mobile applications on tablets or smartphones, computers are used to play games in masses.”

“Okul konusu bakımından ayrıca, çoğu okulda okula teknik cihazların sokulması yasak durumda. Böyle okullarda mobil uygulamalar tablet veya akıllı telefon kullanarak bireysel olarak değil de daha çok bilgisayar kullanarak kitlesel olarak gerçekleşmek zorunda kalıyor.” [Participant 11]

“If I and the students had the necessary materials (mobile devices), it would be used. However, not all the students have tablets, and I cannot use it under that condition.”

“Eğer elimde ve öğrencilerin elinde gerekli materyaller [mobil cihazlar] varsa uygulanabilir ama şimdi hani her öğrencinin bir tableti yok. O tarz durumlarda maalesef uygulayamam.” [Participant 8]

Technical Issues: The participants (n=5) stated that they are likely to have technical issues while integrating mobile games into teaching. They added that it would be hard to get technical support at schools. One participant said:

“Technically, one tablet could break down when we are about to play the game, or it could fail. I could face such problems. Because it is technology, you know, these kind of things happen.”

“Teknik açıdan, örneğin o anda sınıfta tam açtı herkes oyunu oynayacak, birinin tableti bozulabilir. Birininki açılmayabilir. Bu tarz sorunlarla karşılaşabilirim. Sonuçta teknoloji varsa mutlaka böyle bir ihtimal var yani sorun çıkabiliyor.” [Participant 8]

Another one stated:

“...these devices could break down. Who will fix them when it is broken? We should consider it. Besides, there could be a problem related to the game as well. If such a problem occurs, who will the student go to?”

“...bu device'ların bozulma olasılığı var. Bozulduğu zaman kim tamir edecek, bunu düşünmeniz gerekiyor. Bunun dışında oyunla ilgili bir sıkıntı çıkabilir. Oyunla ilgili bir sorun çıktığında öğrenci kime başvuracak?” [Participant 2]

Another one said:

“I would try to fix it by myself but I do not know what would happen if I could not. We will not have any support, probably. We will be the computer teachers there, after all.”

Yani teknik problemi kendim çözmeye çalışırım ama kendim çözememsem bilmiyorum nasıl olur. [Destek] alamayız muhtemelen. Sonuçta orada bilgisayar öğretmeni olan biziz.” [Participant 5]

School Administration's Attitude: The interview results indicated that another major issue in integrating mobile games into teaching was predicted by the participants (n=7) to be the school administration's attitude towards the usage of mobile games in the classroom. The participants think that the school principal and administration may find the mobile games worthless in terms of education. They add that negative attitude of school principal and administration may withhold them from integrating mobile games into the class. The participants said:

“I think if you are working at a private school, the attitude of the parents and the management is really important. I mean I could get reactions like “Are you playing games at school? Kids don not learn anything!”.”

“Özellikle de özel okuldaysanız velilerin ve idarenin tutumu önemli bence. Yani "siz derste oyun mu oynuyorsunuz, çocuklar bir şey öğrenmiyor!" gibi tepkilerle karşılaşabilirim.” [Participant 8]

“We are thinking about the games as applications but they (school management) would see them as games, and that could be a problem. They may think we are not teaching, just playing games.”

“Oyunu biz uygulama diye görüyoruz ama onlar [okul yönetimi] oyun diye düşündükleri için hani belki biraz sorun olabilir. İşte ders anlatılmıyormuş gibi düşünebilirler.” [Participant 2]

“If the principal gave me the authority to do it, then I can easily do it. But if they do not agree with my method, then there is nothing I can do. I cannot force them to let me use mobile games in the classroom.” [Participant 6]

Parents’ Attitude: The participants (n=4) mention that parents may not approve the usage of mobile games in the classroom and that may be a barrier to integrating mobile games into teaching. One of the participants stated:

“If the students are playing games too much at home, maybe they [parents] will blame me as teacher because I am the one who is supposed to teach them.” [Participant 6]

Device Diversity / Compatibility: Only one participant pointed out that mobile devices have wide diversity in terms of brand and operating system. This might constitute a barrier when a mobile game is not compatible with all of devices in a classroom. The participant stated:

“There are different platforms, you know. What works on Android may not work on iOS or so, you know. This is also a simple barrier.”

“Tek elden yürütülen bir şey yok. Bazen hani Samsung'da olan, yani Android'de olan şey iOS'ta olmuyor. O da çok basit bir engel.” [Participant 4]

Barriers on the Teacher's Side

The interview results indicated some factors on the teacher's side that might constitute a barrier to integrate mobile games into teaching. Four codes emerged in that sense as (1) teacher characteristics, (2) experience in teaching, (3) technology opposition, and (4) classroom management.

Teacher Characteristics: The results indicated that teachers must carry some characteristics to integrate mobile games into their classroom. The pre-service teachers (n=2) determine these characteristics as knowing how to use mobile technologies and devices, having control over using the mobile game applications, being innovative, and being tolerant. The absence of these qualifications might be a barrier to integrate mobile games. One of the participants stated:

“I do not think it (using mobile games) is difficult for a computer teacher. Our education allows us to do that. ... About using mobile devices, mobile games, I think it could be difficult for other teachers. That could be a problem.” *“Bir bilgisayar öğretmeni için [mobil oyunları kullanmanın] zor olacağını sanmıyorum. Şu an aldığımız dersler ona yönelik. ... Mobil cihazların, mobil oyunların nasıl kullanılacağına yönelik ama hani diğer öğretmenler için elbette ki zor olabilir. Bu bir engel teşkil edebilir.”* [Participant 10]

The other one said:

“The teacher should be more tolerant and open to new ways. Otherwise, the expected result would not be received. ... Additionally, teachers who are going use these in the class should be qualified enough to integrate these applications.”

“Öğretmenin tolerasyon çitasını normalin biraz üzerine kaldırması ve yeniliklere açık olması gerekir. Aksi takdirde bu tarz uygulamalar istenilen yetkiyi yaratamaz. ... Ayrıca bunları derslerinde uygulayacak kişiler olan öğretmenlerin bu uygulamaları derslerine entegre etmek açısından yeterli düzeyde olması gerekir.” [Participant 11]

Experience in Teaching: Two participants mentioned that becoming an experienced teacher might hinder integrating mobile games into teaching. One of them stated:

“It may be difficult for experienced teachers to get used to these kind of innovations.”

“Uzun yıllar öğretim vermiş tecrübeli öğretmenler için bu yeniliklere alışmak zor, kolay olmayabilir.” [Participant 11]

The other one expressed:

“... I do not think most of the experienced teachers will use it. The lesss the time they spend, the better for them. Maybe that is how I will be, I do not know. Maybe it is easy just to assume it because I am still at the beginning.”

“...ben çoğu tecrübeli öğretmenin çok da tercih edeceğini düşünmüyorum. Ne kadar az zaman, onlar için o kadar iyi oluyor. Belki ben de öyle olurum, bilmiyorum. ... Şu an çok başında olduğum için belki rahat söylüyorum.” [Participant 8]

Technology Opposition: Four participants stated that some teachers might be against having the students interacting with technology. One of them stated:

“Kids already spend enough time with phones, tablets at their homes. I do not know if it is right to make them use these on the classroom. I think it is too much, they are too young. They cannot tell what is right or wrong. I really think it is not necessary making them use these devices too much.”

“Çocuklar zaten evde yeteri kadar görüyorlar telefondur, tablettir falan. Bir de bunları sınıf ortamına taşımak ve sınıfta görmeleri ne kadar doğrudur bilmiyorum. Bence çok aşırı zaten küçükler. Her şeyi yeteri kadar birbirinden ayırt edebilecek şeye [düzeye] sahip değiller. O yüzden bence çok fazla gözlerine sokup da sınıf ortamına getirmeyi gerçekten düşünmüyorum.” [Participant 7]

Another one said:

“I think other teachers could react badly. Even we discuss it in our classes. Some of my class-mates believe that kids should not be raised with games, and it restricts their ability to think.”

“Diğer öğretmenlerden tepki gelebileceğini düşünüyorum. Biz sınıfta bile bunun tartışmasını yaşıyoruz. Bazı arkadaşlar ... “Çocuk oyunla büyümemeli, oyunlar düşünme yeteneğini kısıtlıyor.” şeklinde [düşünüyorlar].” [Participant 1]

Classroom management: The qualitative results revealed that classroom management issues were one of the major barriers to using mobile games in the class. The participants (n=7) expressed that using mobile games in the classroom required a better classroom management. One of them explained:

“You may have a class with really naughty kids, that they can do other stuff on the tablets instead of playing. It is really difficult to control all these if the class is crowded.”

“Öyle bir sınıfınız olur ki, [çocuklar] çok haşere olurlar, gerçekten söz dinlemezler, alırlar sen oynayacaksınız dersin, onlar başka yere girerler. Bunların hepsini kontrol etmek sınıf kalabalıkta gerçekten zor.” Participant 7]

Another one said:

“The classroom atmosphere might go out of order. Students might get into playing more than focusing on learning.”

“Sınıf ortamı çok dağılabilir. Öğrenciler öğrenmeye odaklı değil de biraz daha eğlenceye dönüşebilir.” [Participant 5]

Another one stated:

“The student continues using the phone after the activity is finished. How can we stop that? How should the transition be? ... I would use it at the end of the class and finish the class with it. I would develop strategies.”

“Öğrenci o aktivite bittikten sonra da telefonuyla oynamaya devam ediyor yani. Onu mesela nasıl keseceğiz ya da şu aktivite transition'ları nasıl olmalı. ... Bunu dersin sonunda kullanmaya çalışıp bu şekilde dersi bitirmeye çalışırdım. Kendi kendime küçük stratejiler geliştirdim.” [Participant 4]

Content Appropriateness

Majority of the participants (n=8) indicated that it was not appropriate or feasible to use mobile games for teaching every possible subject. The participants point out that it is easier to use mobile games if the content is mainly visual such as science content. However, the content with less visuality such as literacy may not be appropriate to be taught using mobile games. Participants stated:

“The feasibility of using or adapting the mobile games depends to the class and the subject. For example, using it for physics which have a strong visual side and using it for literature will not be the same.”

“[Mobil oyunları] uyarlayabilmenin kolaylığı anlatacağımız ders ve konuya göre değişir. Örneğin görsel yönün çok olduğu fizik dersini anlatmakla edebiyat dersini anlatmak aynı olmaz.” [Participant 13]

“So, it depends on the topic or the subject. If it is suitable, then we can apply mobile games to subject. But not every subject is suitable. For example, Microsoft Word. There is no game that is interesting enough except for matching, etc. It is so cliché. It depends on the subject.” [Participant 6]

“It could be easily applied in the science classes. ... I think they (mobile games) would be effective most subjects but some subjects cannot be taught through them. But I think most of them would be better taught through games.”

“Özellikle fen alanında kolay uygulanabilir. ... [Mobil oyunların] çoğu konuda etkili olacağını düşünüyorum ama bazı konular, tabi her konu da mobil oyun kullanarak anlatılamaz. Ama çoğu şeyin güzel olacağını düşünüyorum bununla daha.” [Participant 5]

4.3.2 Barriers to Creating Mobile Games

As for creating mobile games, two themes emerged from the interview results as (1) design and development process, and (2) teacher characteristics.

Design and Development Process

The participants indicated the factors that are related to design and development process of mobile games as barriers to creating them. The codes emerged from the interview results in that sense are (1) time consuming, (2) requiring extra effort, (3) increasing workload, (4) help requirement for creating games, (5) difficulty of the process.

Time Consuming: Three pre-service teachers expressed that creating mobile games was a time consuming process for them. One of them states:

“I do not think designing a mobile game for my needs will be easy. It will take a lot of time, just like I did before. ... I mean instead of spending 3 hours to create a single application; I could find 3 different materials in that time.”

“Çok kolay olmaz bence kendi ihtiyacıma göre bir mobil oyun tasarlamak. Bayağı bir vakit harcarım. Harcadım da zaten. ... Yani oraya sarf edeceğim enerjiyi, atıyorum 3 saat onunla uğraşıp 1 şey ortaya çıkartacağım. Diğer tarafta 3 saat uğraşıp 3 farklı materyal ortaya çıkartabilirim.” [Participant 7]

Another one explains:

“It really requires a lot of time. I am not good at mobile game designing. When I decide to design a game, there will be a lot of things that I should learn and make research about. So, I will need extra time for that.”

“Bir kere çok ciddi zaman gerektiriyor. Sonuçta ben bu mobil oyun tasarımına hakim değilim. Tasarlamaya karar verdiğimde pek çok bilmediğim şey çıkacak ve ekstra araştırmam gerekecek. Bu açıdan zamana ihtiyacım olacak.” [Participant 8]

Requiring Extra Effort: The participants (n=4) stated that it required extra effort to create mobile games compared to creating a traditional teaching material. They explained that creating a mobile game required consideration of various things such as usability, and content presentation in order to make sure that the mobile game is viable. One participant explained:

“It is difficult to design it from scratch. You need to consider everything. For example, how students use it, if they access it easily, if they understand everything of it. ... It requires extra effort to consider all these.”

“Sıfırdan tasarlamak biraz zor olabiliyor. Bunun için de her şeyi düşünmek gerekiyor. Mesela öğrenciler nasıl kullanıyor, rahatça erişebiliyor mu, her şeyini anlayabiliyor mu? ... Tüm bunları düşünmek uğraştırıcı ve zahmetli.” [Participant 10]

Another one stated:

“It takes more effort, which is expected. When you put technology in education, it does not mean it will be easier. I mean, the result could be rewarding but it takes some effort for sure.”

“Birazcık daha uğraş gerektiriyor ki zaten bu beklenen bir şey. Eğitimde işin içine teknolojiyi sokunca “Bu daha kısa olur.” diye bir şey yok. Tamam, belki meyvesi daha güzel oluyor teknoloji olunca ama sonuç itibariyle uğraştırıcı.” [Participant 3]

Increasing Workload: Four participants stated that creating mobile games would increase their workload outside the classroom. They explained that integrating mobile games would require them to carry out some pre-planning and paperwork as well as requiring them to follow instructional strategies carefully while designing a game. One participant stated:

“It may increase my workload in a way to design that game or improve an existing game, as well as planning the classroom beforehand.”

“İş yükümü artırabilir bir bakıma o oyunu tasarlamak ya da var olanı geliştirmek, işte sınıfı o planlamaya dahil etmek vs.” [Participant 8]

Another one expressed:

“It will increase my workload. If I need to prepare different games for different subjects, then it is extra workload.”

“İş yükümü artırır. Çünkü farklı konular için farklı oyunlar hazırlayacaksak ve hep dersleri öyle işleyeceksek ekstra yük getirir.” [Participant 5]

Another one said:

“It will increase my workload. You have to have time for it, make plans, write reports or keep up with the standards developing it. My workload will increase.”

“İş yükümü artıracaktır. Bunun için ayrı bir zaman ayrılacak, belli planlar belli raporlar hazırlanacak. Ya da belli standartlara uyulması gerekiyor geliştirirken. İş yüküm artar.” [Participant 2]

Help Requirement for Creating Games: The interview results indicated that the participants (n=4) might need help, support, or guidance of someone more competent in creating mobile games during the design and development process. One participant stated:

“I do not receive sufficient education for developing these kind of games. At the CEIT 422 lecture, I had hard time designing a mini-game. I do not think I have the qualifications for it. So, I may need to get help in order to create a game that will help my students understand the subject.”

“Bölümüm bu tarz oyunlar geliştirebilmek için yeterli bir eğitim vermiyor. Aldığım CEIT 422 dersinde bile ufak bir oyun tasarlamak için epey zorlandım. Bu konularda yeterli bilgim olmadığını düşünüyorum. Bu yüzden öğrencilerin konuları daha iyi anlamasını sağlayacak bir oyun geliştirmek için bilen birinden yardım almam gerekebilir.” [Participant 12]

Another one said:

“I got the idea of making a puzzle game like that. [I] asked my friends who are better in programming to teach me how to do it. And I do it; I make some errors and asked [for] their help to fix it.” [Participant 6]

Difficulty of the Process: Two of the participants stated that they found mobile game design and development process difficult. They explained that mainly the development and coding process exceeded their capacity. One explains that:

“I do not think that it is very easy to create mobile games. ... Creating it a game is complicated. It is above my qualification.”

“[Eğitsel mobil oyun üretmenin] çok kolay olduğunu düşünmüyorum. ... Kendim üretmek karışık geldi bana biraz. Kapasitemin üstünde geldi.” [Participant 9]

The other one states:

“It would be easier to use already existing games but I think that would be harder if I had to do it. Because coding is hard in every aspect.”

“Halihazırda olan oyunları kullanmak daha kolay olur ama kendim yapacaksam bayağı bir zor olacaktır benim için muhtemelen. Çünkü her konuda kod yazmak zor.” [Participant 7]

Teacher Characteristics

The qualitative data analysis indicated that there were some important characteristics that teachers needed to carry in order to create games. The participants pointed out that lack of these characteristics was a barrier for them to create games. Two codes; (1) lack of creativity, and (2) lack of game design knowledge emerged as for these characteristics.

Lack of Creativity: Two participants stated that they were not creative. They stated that they had hard time coming up with a good game design idea. One of them explained:

“I am not a creative person. You should have a creative, different idea before designing the game. I think that is the hardest part for me. I may have trouble designing because I am not creative.”

“Çok yaratıcı bir insan değilim. Öncelikle tasarlamadan önce de çok düşünmem lazım yaratıcı, farklı bir etkinlik. En çok o noktada zorlanırım bence. Yaratıcı olmadığım için biraz tasarlamakta sıkıntı çekebilirim.” [Participant 8]

The other one stated:

“I am not a creative person. I have to see other games first, and then come up with an improvised version of that game. ... I am not a creative person to come up with a new idea.” [Participant 6]

Lack of Game Design Knowledge: The results of the interview indicated that the participants (n=6) had lack of game design knowledge. They stated that their current game design knowledge was just sufficient to create very simple games, and needed to improve to build better mobile games. One of them stated:

“I am really bad at this. That is all I know. I could only use directions to do what I really know, and that is very limited for now.”

“Gerçekten çok yetersizim bu konuda. ... Sadece yapabildiğim belli başlı [şeyleri] direction'lara dayanarak yapabilirim.” [Participant 7]

Another one expressed:

“I am not fully qualified about mobile game design after all. Once I decide what I will design, I will have to face a lot of new things that I do not know, and I will have to make an extra research for them.”

“Sonuçta ben bu mobil oyun tasarımına hakim değilim. Tasarlamaya karar verdiğimde pek çok bilmediğim şey çıkacak, onları ekstra araştırmam gerekecek.” [Participant 8]

Another one said:

“I may have to work on it. Because I may have difficulties trying to do more complicated games but I think it was a great start for me.”

“Belki üzerine koymam gerekebilir. Çünkü biraz daha kompleks bir şey hazırlamaya kalksam tıkanabilirim ama çok güzel bir başlangıç olduğunu düşünüyorum.” [Participant 3]

4.4 Pre-service Teachers' Experiences about Mobile Games (R.Q. 4)

In the survey, the participants were asked about their experiences with mobile games. The results obtained from the relevant part of the survey can be found in Table 4.3.

Table 4.3 Personal Experience about Mobile Games

#	Item		SD	D	N	A	SA	M	SD
1	I play mobile games on daily basis.	f %	5 10%	9 18%	11 22%	18 36%	7 14%	3.26	1.21
2	I prefer playing mobile games for fun.	f %	1 2%	3 6%	9 18%	27 54%	10 20%	3.84	0.89
3	I prefer playing mobile games for learning new concepts.	f %	5 10%	6 12%	15 30%	21 42%	3 6%	3.22	1.08
4	I have a positive experience in playing mobile games.	f %	0	3 6%	13 26%	26 52%	8 16%	3.78	0.79
5	I have a negative experience in playing mobile games.	f %	7 14%	24 48%	12 24%	6 12%	1 2%	2.40	0.85
6	My friends play mobile games almost every day.	f %	1 2%	4 8%	15 30%	20 40%	10 20%	3.68	0.98
7	I prefer my friends to play mobile games.	f %	1 2%	7 14%	19 38%	21 42%	2 4%	3.32	0.84
8	My family plays mobile games almost every day.	f %	16 32%	12 24%	11 22%	8 16%	3 6%	2.40	1.26
9	I prefer my family to play mobile games.	f %	8 16%	13 26%	14 28%	12 24%	3 6%	2.78	1.17
10	I have taken several classes on mobile games.	f %	10 20%	11 22%	12 24%	15 30%	2 4%	2.76	1.21

According to the results, half of the participants (N=25 or 50%) stated that they play mobile games on a daily basis. 74% (N=37) of the participants indicated that they play mobile games for fun. Nearly half of them (N=24 or 48%) stated that they prefer

playing mobile games for learning new concepts. Majority of the participants (N=34 or 68%) declared that they have positive experience in playing mobile games. 62% (N=31) of the participants disagreed or strongly disagreed on the item “I have negative experience playing mobile games.”. 60% (N=30) of the participants stated that their friends play mobile games almost every day. 46% (N=23) of them also stated that they prefer their friends to play mobile games. Differently than that, more than half of the participants (N=28 or 56%) disagreed or strongly disagreed with the statement that their families play mobile games almost every day. Moreover, the participants (N=21 or 42%) disagreed or strongly disagreed on that they prefer their family to play mobile games. Lastly, nearly the half of the participants (N=21 or 42%) stated that they have not taken several classes on mobile games.

In terms of video gaming background, the demographic information that was obtained through the survey indicated that 16 (32%) of the participants learnt how to play video games in the family while 30 (60%) of them learnt it from friends, 2 (4%) of them learnt it on their own, and the rest (N=2 or 4%) stated that they do not play video games. As for the gaming platform, 15 (30%) of the participants use personal computers (PC) at most, 31 (62%) of them use mobile devices such as smart phones or tablets at most, and 2 (4%) of them use game consoles (e.g. Playstation, Xbox, Nintendo Wii, etc.) at most. Figure 4.1 shows the distribution of the participants by the game platform they use the most.

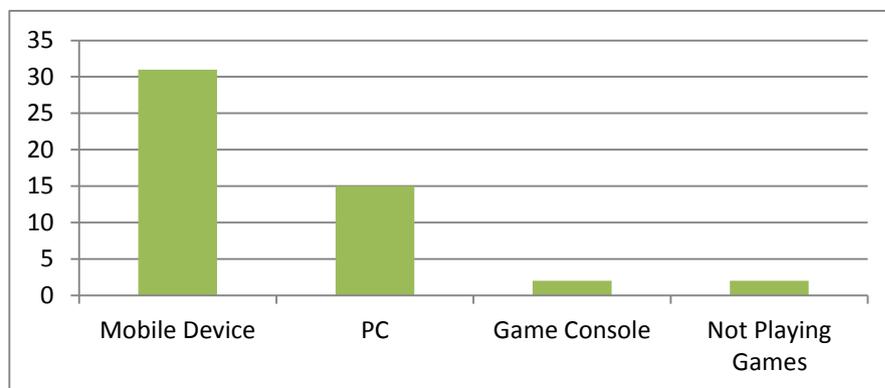


Figure 4.1 Distribution of Participants by the Game Platform Mostly Used

A vast majority of the participants (N=45 or 90%) had never designed or developed video games before participating in this study. Similarly, 44 (88%) of them had never developed mobile applications before either. Video game or mobile app design and development background of the participants are shown in Table 4.4.

Table 4.4 Background of Participants regarding Video Game and Mobile Application Design and Development

Statement		Yes	No
Have you ever designed or developed video games before this course?	f	5	45
	%	10%	90%
Have you ever designed or developed mobile applications before this course?	f	6	44
	%	12%	88%

4.5 Summary of Findings

The results showed that the majority of pre-service teachers were already familiar with mobile games. They showed positive attitude towards mobile games in general.

As for integrating mobile games into teaching, the pre-service teachers were found to be willing to use mobile games in their teaching profession. They value mobile games regarding the use for educational purposes. They also believe that using mobile games will be of help to improve their professional skills. The pre-service teachers consider using mobile games in the future as a supplementary instructional material, homework assignment, or an after-class activity. They believe that mobile games can be a teaching aid in terms of grabbing student's attention, and supporting kids with special needs. They also point out some benefits of mobile games to students as increasing academic achievement, maintaining retention, providing efficient learning, making learning fun, motivating students, drawing interest, engaging student's and transforming students' negative beliefs towards the course. In addition to all these positive beliefs, they also express that mobile games should be utilized carefully. They mention some considerations of using mobile games as enhancing teacher's role, considering students' characteristics before using games,

making sure not to limit or hinder students' social interaction, taking advantage of the flow state that the mobile game will provide, and preventing unwanted outcomes.

The pre-service teachers found to have different perceptions on enablers in using mobile games in the classroom, and creating a mobile game to use in the classroom. Pre-service teachers stated that using mobile games in the classroom would be beneficial to them in terms of enhancing job performance, promoting self-confidence, saving time, decreasing their workload, and creating a good teacher image. They stated that creating their own mobile games for teaching would promote their self-creativity and self-productivity as well as allowing them to use a mobile game just tailored to their own needs, increasing their competency, and extending their point of view.

As for the barriers to integrating mobile games into teachers, again their perceptions on barriers to use mobile games in the class and barriers to create mobile games fall into different categories. Pre-service teachers point out that learning environment would be the main issue of using mobile games in the class. They mention that providing each kid with a mobile device (e.g. a tablet or a smart phone) might not be possible. As for the barriers to create a mobile game, they state that the design and development process would be difficult and time consuming. Also, some teachers might not have the required qualifications to create a mobile game.

In conclusion, although pre-service teachers found using games in the classroom easy and helpful to their profession, they mainly find creating the mobile game a difficult or a tiresome job. They state that they would be more likely to use an already existing and ready to use mobile game as long as they found a suitable one for their teaching purposes.

CHAPTER 5

DISCUSSION, CONCLUSION AND IMPLICATIONS

This chapter includes major findings of this study, discussion and conclusion, implications, and suggestions for future research. The purpose of this study was to investigate pre-service teachers' beliefs in integrating mobile games into teaching, and perceptions on the barriers and enablers in integrating mobile games into teaching after engaging in an educational mobile game design and development process. This study also explored pre-service teachers' personal experiences about mobile games. Participants were 50 pre-service teachers from the departments of Early Childhood Education, Computer Education and Instructional Technology, Elementary Science Education, and Foreign Language Education at Middle East Technical University. The participants were engaged in training for 3 weeks. Then they were engaged in an educational mobile game design and development activity (mini-game project). Twenty-seven participants completed the mini-game project. Afterwards, the data were collected through a survey from 50 participants which was followed by semi structured interviews that conducted with 13 participants that are selected from the participants who successfully completed the mini-game project.

5.1 Discussion and Conclusion

5.1.1 Pre-Service Teachers Beliefs in Integrating Mobile Games

The pre-service teachers' beliefs in integrating educational mobile games into teaching mainly focus on the benefits of educational mobile games, their intended usage of mobile games, and considerations for integrating mobile games.

According to the results, a greater majority of participant pre-service teachers find it important to integrate mobile games in the classroom. They also stated that they valued the use of mobile games in teaching. These findings were noted in the previous research. Pre-service teachers showed interest and willingness to use educational games in their future practice (T. Hsu & Chiou, 2011; Topçu et al., 2014). Similarly, in-service teachers also showed positive attitude towards educational game use (Demirbilek, 2010; Noraddin & Kian, 2015). However, in the current study, pre-service teachers expressed that they are not sure whether it is still important in the classroom even when mobile games do not provide learning experience. About this issue, Kim, Park, & Baek (2009) stated that even commercial game play without any educational purposes could be helpful for academic achievement in terms of kids' social problem solving, collaboration and cooperation skills. This could mean that the pre-service teachers are not fully aware of what video/mobile games have to offer (Baek, 2008; Prensky, 2001; Schrader et al., 2006). This finding is in line with the video game playing habit of the participants. Although half of them stated that they played mobile games on daily basis, the other half either remained neutral or stated that they did not. Naturally, they might not to be fully aware of what benefits playing games has for the students outside of the content.

As for the benefits the mobile games have to offer for students, both quantitative and qualitative data showed that the mobile games are believed to increase students' engagement, and enhance learning. Studies that focus game based learning showed that the educational games do provide engagement, enhanced learning (Hamari et al., 2016; Hung et al., 2015). Additionally, the qualitative data analysis indicated that pre-service teachers found the educational mobile games to increase academic achievement, maintain retention, make learning fun, motivate students, draw students' interest, and to transform students' negative beliefs. These findings were already noted by several researchers. Hsu & Chiou, (2011) and Topçu, Küçük, & Göktaş, (2014) found in their studies that pre-service teachers believed educational video games to be useful in terms of increasing student interest to the subject matter, maintaining retention, providing a fun learning environment. In line with the other findings of this research, the pre-service teachers seem to consider the mobile games

beneficial for educational purposes. However, they did not mention other benefits of mobile games such as helping improve students' social problem solving skills, collaboration and cooperation skills.

5.1.1.1 Pre-Service Teachers' Intended Use of Mobile Games

In this study, pre-service teachers were engaged in an educational mobile game design and development process. The mobile game that the pre-service teachers created was a mini-game. The qualitative findings showed that nearly all of the pre-service teachers thought the games they created would be best used as a supplementary material in order to reinforce learning. Moreover, pre-service teachers stated that those mini-games were not really capable of covering an entire lecture or not suitable as the main instructional material. This finding corroborates Prensky's (2008) following statement:

Mini-games are not 'bad' for learning, but they are limited in their scope. You might learn a single skill or idea from one of them, but no mini-game, by itself, will give you an education, or even teach you about a broad piece of subject matter. (p. 1006).

Furthermore, Furió, González-Gancedo, Juan, Seguí, & Costa (2013) asserts on the issue that mobile games are good components for reinforcement of the learning content. Additionally, mobile games could be integrated in the curriculum as an activity along with the other activities and resources in order to enrich learning experience (Romero & Barma, 2015). This could indicate that pre-service teachers might have grasped the affordances of mobile mini-games through the design and development process they were engaged in this study.

Another intended usage that pre-service teachers stated was assessment. Similarly, in another study that engaged pre-service teachers in an educational computer game re-designing activity revealed that most of their participants focused on integrating their games as an assessment approach (Sancar Tokmak & Ozgelen, 2013). It can be said that the pre-service teachers consider utilizing game technologies not only for teaching purposes, but also evaluation of the learning process.

5.1.1.2 Considerations for Use

The qualitative data analysis indicated that mobile games should be used carefully. Pre-service teachers specified some considerations that using mobile games required. One of them was student characteristics. The pre-service teachers pointed out that all the students might not have the same background in terms of familiarity with games or mobile devices. They add that the integration of a new technology such as mobile educational games might require a training beforehand. This finding is consistent with the relevant literature. Baek (2008) stated that the difference in students' readiness levels regarding participating in a new technological activity like mobile gaming might cause unsatisfactory learning outcomes. In another study where the pre-service teachers designed and developed their own games, the results indicated that the games required the students to have pre-knowledge about the game and the content in order to make benefit from it (Sancar Tokmak & Ozgelen, 2013).

Pre-service teachers also pointed out that utilizing educational mobile games in the classroom should not hinder social interaction between students during the gameplay. They mentioned that the mobile games could be designed as multi-player in order to assure interaction among students. Moreover, pre-service teachers think that playing games in a common context may allow students to have discussions about the game afterwards, which can eliminate the limited social interaction during gameplay. In the same way, Furió et al., (2013) reported that social interaction in a mobile game could be enhanced through collaboration and competition, which could be possible by enabling a multiplayer mode. Collaborative games support social and technical skills to be developed (González-González & Blanco-Izquierdo, 2012). Moreover, the competition and collaboration that games provide are the reasons why games are motivating contexts (Berns et.al, 2013). Additionally, previous studies on video games revealed the learning opportunities that the gaming communities offered. González-González & Blanco-Izquierdo point out that other than games; also gaming communities allow social learning to take place regardless the game content. Gaming communities provide gamers with a socially interactive space where discussion and

sharing of interpreted experience between novice and experience players occur (Gee, 2009). Sung & Hwang (2013) assert that students' learning performance increases as they discussed and organized the knowledge they acquired through games.

Another concern that the interview results of the current study revealed is the flow state that students might experience during the game play. Pre-service teachers state that the concentrated state provided by flow might be useful if the teacher knows how to take advantage of it. However, it might cause the student to lose the sense that he is still in the classroom. On contrary, there is no negative outcome reported in the literature that the flow state caused in the classroom environment. The current studies show that flow experience has an improving effect on learning outcomes and satisfaction (Hamari et al., 2016; Hung et al., 2015). The participant pre-service teachers did not have much field experience. It was expected for them to be worried about classroom management.

The qualitative data analysis indicated that one pre-service teacher was concerned about the unwanted outcomes that mobile games could cause. She explained that before introducing a mobile game to the students, the game should be thoroughly investigated in terms of unsuitable content in order to prevent from unwanted outcomes to occur. According to the prior research in line with this, Dickey (2013) stated that becoming too immersed in a virtual world might leave a negative impact on young students' developing behaviors and minds. This finding implies that the teacher should have adequate qualification to judge a game as a learning material as to being appropriate for students or not.

5.1.2 Pre-Service Teachers' Perceptions on Enablers

The data analysis of this study indicated some enablers for pre-service teachers to integrate educational mobile games in order to answer the second research question of this study.

Both quantitative and qualitative data showed that pre-service teachers found using educational mobile games in the classroom could be beneficial for them in terms of enhancing their job performance, and their teaching ability. They stated that they

could expand teaching skills by using mobile games in the classroom. These findings contradict the results of a recent study by Bourgonjon et al., (2013). Their findings showed that teachers did not perceive video game tools useful in terms of improving their job performance and making their job easier. This contradiction might be caused by the educational mobile game design and development process that this study engaged the pre-service students in. In line with this finding, the results of the current study also showed that creating mobile games made pre-service teachers more competent. Pre-service teachers expressed that creating a mobile game required them to know the subject matter to the finest detail. In this way, creating a mobile game increased their competency. Likewise, Klopfer, Sheldon, Perry, & Chen (2012) confirm that in order to be able to design educational games, the designer should carry a solid understanding about game design, the learning process, the content to teach, and the technology that will be utilized. In addition, it can also be said that the pre-service teachers of new generation feel more comfortable about integrating technology into their classrooms.

The interview results indicated that pre-service teachers find educational mobile games decreasing workload in the classroom. This is another finding that contradicts the relevant literature. The previous studies indicated that educational game use in the classroom increased workload (Becker, 2007; Can & Cagiltay, 2006; Kebritchi, 2010). Although there seems to be a contradiction, the pre-service teachers in the current study made it clear that they though mobile game integration would increase their workload outside of the class, since it required a lot of planning beforehand. However, in the classroom, they believe mobile games could ease their job. Similar to the previous results, this finding supports that the pre-service teachers of new generation are more comfortable about using games and integrating such technology into their classrooms.

Pre-service teachers stated that mobile games are enjoyable to use in the classroom. This finding corroborates with the previous studies showing that pre-service teachers are found to enjoy playing video games and to be open to try new technological

applications (Chen, Chen, Chen, & Yang, 2012; Hsu & Chiou, 2011; Schrader et al., 2006).

Another enabler that the results revealed was game-based learning awareness. According to the results, some of the pre-service teachers already have this awareness, but some of them gained it with participating in this study. It was stated by some the pre-service teachers that they would not think of utilizing such a strategy if they did not participate in this study. Similarly, many studies in the literature pointed out that some teachers are not aware of the potential of the content and pedagogical opportunities that video games offer (Baek, 2008; Schrader, Zheng & Young, 2006; Prensky, 2003).

As an enabling factor to create a mobile game, pre-service teachers state that having games tailored to their own needs would be one. They explained that the mobile games of their self-creation would be tailored to the level of the class, and that would allow the teacher to utilize teaching strategies best fitting to their needs without remaining limited to the mobile app markets or off-the-shelf games the others developed. These results are also supported by the findings of Romero & Barma's (2015). In their study, Romero & Barma point out that teachers should be enabled to create their own game applications, or to customize and repurpose an existing game. This way, the pre-service teachers will no longer expect to find a perfectly matching game application according to their own needs, before using games in their classroom (Romero & Barma, 2015).

5.1.3 Pre-Service Teachers' Perceptions on Barriers

Both quantitative and qualitative analysis indicated that pre-service teachers think that integrating mobile games would increase the workload. Additionally, pre-service teachers state that integration of mobile games is time consuming, requiring extra effort, and a difficult process, especially if they are creating their own games to use in the classroom. Prior research has also confirmed these findings. Computer game development is a process that requires a decent amount of time (Ertzberger, 2008; Huang & Huang, 2015). Continuity of the game activity, timing of game activities,

preparation requirements before the class should be considered while integrating games (Altan, 2011). Additionally, to learn and make work such a new technology requires a lot of time and effort with the heavy workload that the teachers are already under (Becker, 2007; Can & Cagiltay, 2006; Ertzberger, 2008; Kebritchi, 2010, Topçu et al., 2014).

According to pre-service teachers, learning environment and mobile device availability could be one of the barriers in integrating mobile games into teaching. This finding was noted in many studies before (Altan, 2011; Baek, 2008; Bensiger, 2012; Ertzberger, 2008; T. Hsu & Chiou, 2011; Romero & Barma, 2015; Topçu et al., 2014). Romero & Barma suggest that teachers could manage classroom activities in turns to create collaborative challenges, or they could follow 'Bring Your Own Device' (BYOD) policy to remedy this gap. Especially with the mobile devices such as smartphones or tablets, BYOD policy might be a successful strategy to follow. Some of the pre-service teachers mentioned that the students could bring their own devices to the classroom, but smart phones usually were not allowed at schools. So, there might be some considerations for putting BYOD policy in the practice as well.

Pre-service teachers state that being an experienced teacher might hinder integrating mobile games into teaching. Prior research also explains that the most experienced teachers might be reluctant to adopt a new technology, so they might feel more comfortable going with fixed schedules (Kebritchi, 2010).

Pre-service teachers expressed that using mobile games in the classroom required a better classroom management. Similarly in a previous study, pre-service teachers stated that video game use might make classroom management difficult for them (Topçu et al., 2014). The experienced teachers who have strong technical background might feel more comfortable in using such new technologies in their classroom settings compared to the ones who do not (Can & Cagiltay, 2006).

5.2 Gaming Experience of Pre-Service Teachers

In this study, the fourth research question focused on game experiences of pre-service teachers. The survey results indicated that almost all of the participants played games. A half of them play games on a daily basis. And to play games, majority of them use mobile platforms such as phones or tablets at most. On contrary, the study of Bourgonjon et al. (2013) exposed that their participant teachers had no previous experience with video games. Ertzberger (2008) also states that the teachers were found to have very low familiarity with video games. This contradiction might be showing that pre-service teachers of new generation are familiar with games, and again, they are more open to adopt game technologies for their profession.

5.3 Implications for Practice

The participants of this study were the pre-service teachers in CEIT, ECE, ESE, and FLE departments in Middle East Technical University. Although the participants were from different departments, the majority of them were ECE and CEIT students. This should be considered while interpreting the results of this study. Additionally, generalizing the findings might not be possible since the participants presented a convenient sample.

This study showed that the pre-service teachers are capable of creating their own games no matter what technological background they had even with a short time of training as three weeks. The participant pre-service teachers' perceptions were investigated in detail. This study can be helpful for practitioners and teacher educators who would like to employ a block-based programming activity in their own profession.

The results also indicated that the pre-service teachers mainly have positive beliefs toward creating their own games for teaching and game based learning in general. A game design course can be added to teacher education curriculum.

The results of this study provide a comprehensive understanding about pre-service teachers' perceptions, personal beliefs, and experiences of educational mobile games. Especially for this study engaged the pre-service teachers in a hands-on game design and development process, their perceptions and beliefs could be helpful for designing a more structured game-design course which specifically targets pre-service teachers and aims at introducing them to how game design and instructional strategies can be utilized together.

5.4 Suggestions for Further Research

This study can be replicated with a more structured and extended training period. Especially with a game design and development assignment which is mandatory for all participants.

The findings of this study showed some of the contradictions with the previous researches might be caused by the rapidly changing technology and the divide it generates between generations. A study might be conducted that particularly focus on investigating how pre-service teachers of the new generations' perceptions differ in terms of utilizing the recent technology in their practice.

In this study, 27 of participants designed and developed their own mobile educational games. Evaluating these artifacts was not the focus of this study. In the future, another study might be conducted to further analyse how pre-service teachers' combine the game elements and learning content as well as the instructional strategy.

Another study could investigate what kind of differences emerge amongst the pre-service teachers regarding the department in terms of designing and developing educational games.

A structured educational game design course can be added to teacher education curriculum, and its effects can be researched extensively.

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APPENDIX A

PERCEPTIONS OF PRE-SERVICE TEACHERS IN USING MOBILE GAMES AS ONE OF THEIR TEACHING TOOLS

Thanks for your participation.

This survey is designed to determine the perception of pre-service teachers in using video game enhanced curriculum in their classroom. "Video game" stands for any sort of digital games including mobile game applications.

By completing this survey, you give permission for your response to be used in this study. The entire data will be kept confidential and only used for academic purpose.

If you have any questions about the survey or this research, you can contact me at "merve.guleroglu@metu.edu.tr".

Merve Güleroglu

*Required

What program are you currently enrolled in? *

Your department.

Age *

- Younger than 20
- 20-25
- 26-30
- Older than 30

Gender *

- Female
- Male
- Don't want to say

Where did you learn how to play video games? *

- Family
- Friends
- Other:

What device do you mostly use for playing video games? *

- Computers
- Mobile devices (Phone or tablet)
- Game consoles (Playstation, Xbox, etc.)
- Portable game consoles (PSP, Wii U, etc.)
- Other:

Have you ever designed or developed video games before? *

- Yes
- No

Have you ever designed or developed mobile applications before? *

- Yes
- No

Does your education experience help you to design video games? *

Prior attendance to a course for developing or designing video games

- Yes
- No

Does your education experience help you to develop mobile applications? *

Prior attendance to a course for developing or designing mobile applications

- Yes
- No

I. Personal experience about mobile games: *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I play mobile games on daily basis.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I prefer playing mobile games for fun.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I prefer playing mobile games for learning new concepts.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a positive experience in playing mobile games.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a negative experience in playing mobile games.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My friends play mobile games almost everyday.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I prefer my friends to play mobile games.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My family plays mobile games almost everyday.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I prefer my family to play mobile games.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have taken several classes on mobile games.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

II. Personal belief in implementing mobile games: *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Integrating mobile games in the classroom is important.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe the use of mobile games in the classroom will increase the students engagement.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I value the use of mobile games in teaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe in the use of mobile game in the classroom to enhance my teaching ability.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can expand my teaching skills by using mobile games in the classroom.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The percentage of my colleagues and students use mobile games is high (use on daily basis).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I play mobile games to relieve tension or stress.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I play mobile games I get tension or stress.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe that even when mobile games do not provide learning experience it is important in the classroom.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe that mobile games could enhance the learning experience of the students.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

IV. Barriers in integrating mobile game: *

Organization: School you expect to be working at. Supervisor: School principal/headmaster.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Mobile games enhanced classroom needs more technical support.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My organization allows me to install software applications based on my classroom needs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My school allows me to get adequate training opportunities to learn new technology that could be used in the classroom.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is too hard to identify the right mobile game for the students.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Integrating mobile games would increase my workload.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mobile game is time consuming.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I use a mobile game, I may not be able to cover the given syllabus.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am comfortable in discussing with my supervisor about integrating mobile games in the classroom.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More financial assistance from the government is needed to implement mobile games in the classroom.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX B

INTERVIEW QUESTIONS (TURKISH)

Görüşme Protokolü

Merhaba,

Öncelikle çalışmada katılımcı olarak yer aldığınız için teşekkür ederim. CEIT319/422 dersi kapsamında yaptığınız mini-oyun geliştirme etkinlikleri deneyiminiz üzerine bir görüşme yapacağız. Görüşme yaklaşık 10-15 dakika sürecektir. Bu sorulara içtenlikle cevap vermeniz çalışmanın geçerlik ve güvenilirliği açısından önemlidir. Görüşme sırasında vereceğiniz cevaplar ses kayıt cihazı ile kaydedilecektir. Bu kayıtlar ve kimliğiniz gizli tutulacaktır. Hiçbir şekilde üçüncü şahıslar ile paylaşılmayacaktır.

Kendinizi hazır hissettiğinizde görüşmeye başlayabiliriz.

Görüşme Soruları

1. Eğitsel mobil oyun uygulamaları kullanmak ilerde vereceğiniz eğitimi nasıl etkiler? Neden?
 - a. Öğrencilerin derse aktif katılımı (artırmak) bakımından
 - b. Öğrencilerin sosyal becerileri (gelişimi) bakımından
 - c. Öğrencilerin akademik becerileri (gelişimi) bakımından
2. Eğitsel mobil oyun kullanmak sizi yaptığınız işe daha hakim kılar mı?
 - a. Evet> Nasıl? / Hayır> Neden?
3. Eğitsel mobil oyun kullanmak mesleğinizde size hangi açılardan destek olabilir?
 - a. Hangi ihtiyaçları, nasıl karşılayabilir?
 - b. Üretkenliğinizi hangi açılardan, nasıl etkiler?
 - c. Mesleki performansınızı nasıl etkiler?
 - d. Peki bu derste geliştirmeyi öğrendiğiniz mini-oyun uygulamasıyla sizce meslek hayatınızda neler yapabilirsiniz?
4. Mobil eğitsel oyunlar ilerde vereceğiniz eğitimin amaçlarına hizmet edecek şekilde kolayca uyarlanabilir mi?
 - a. Evet> Nasıl uyarlardınız? / Hayır> Neden uyarlanamaz?
5. İleride sizin için mobil eğitsel oyunları sınıf içinde kullanmak yeterince kolay olur mu?
 - a. Evet> Nasıl? / Hayır> Neden?
 - b. Peki yeni bir mobil oyunla karşılaşırsan bu durum nasıl olur?

6. Kendi ders ihtiyalarınıza uygun bir mobil oyun tasarlamak ve geliřtirmek sizin iin kolay bir iř midir? Neden?
7. Eđitsel mobil oyunları sınıfa entegre etme konusunda ne dűřünüyorsunuz?
 - a. Bir konuyu mobil oyun kullanarak đretmek konusunda ne dűřünüyorsunuz?
8. Meslek hayatınızda eđitsel mobil oyunları kullanmayı dűřünüyor musunuz?
 - a. Evet> Nasıl kullanacaksınız? / Hayır> Neden?
9. Eđitsel mobil oyunların entegrasyonunda karřılařılabilecek engeller neler olabilir?
 - a. Teknik destek aısından
 - b. alıřacađınız okul aısından
 - c. Gerektireceđi eđitim aısından
 - d. iř yűkünüz bakımından

APPENDIX C

THEMES AND CODES OF THE INTERVIEW

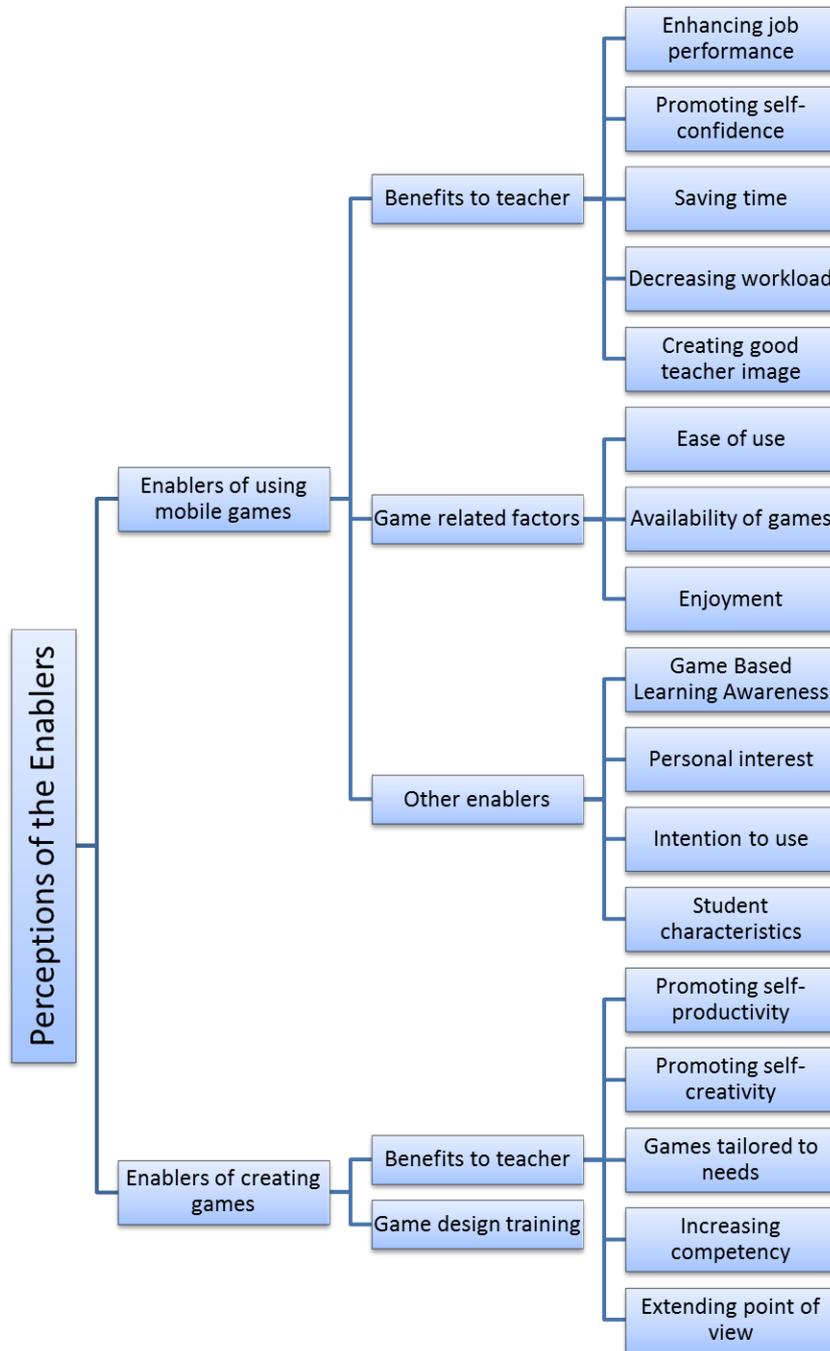


Figure C.1 Codes and Themes for Perceptions of the Enablers

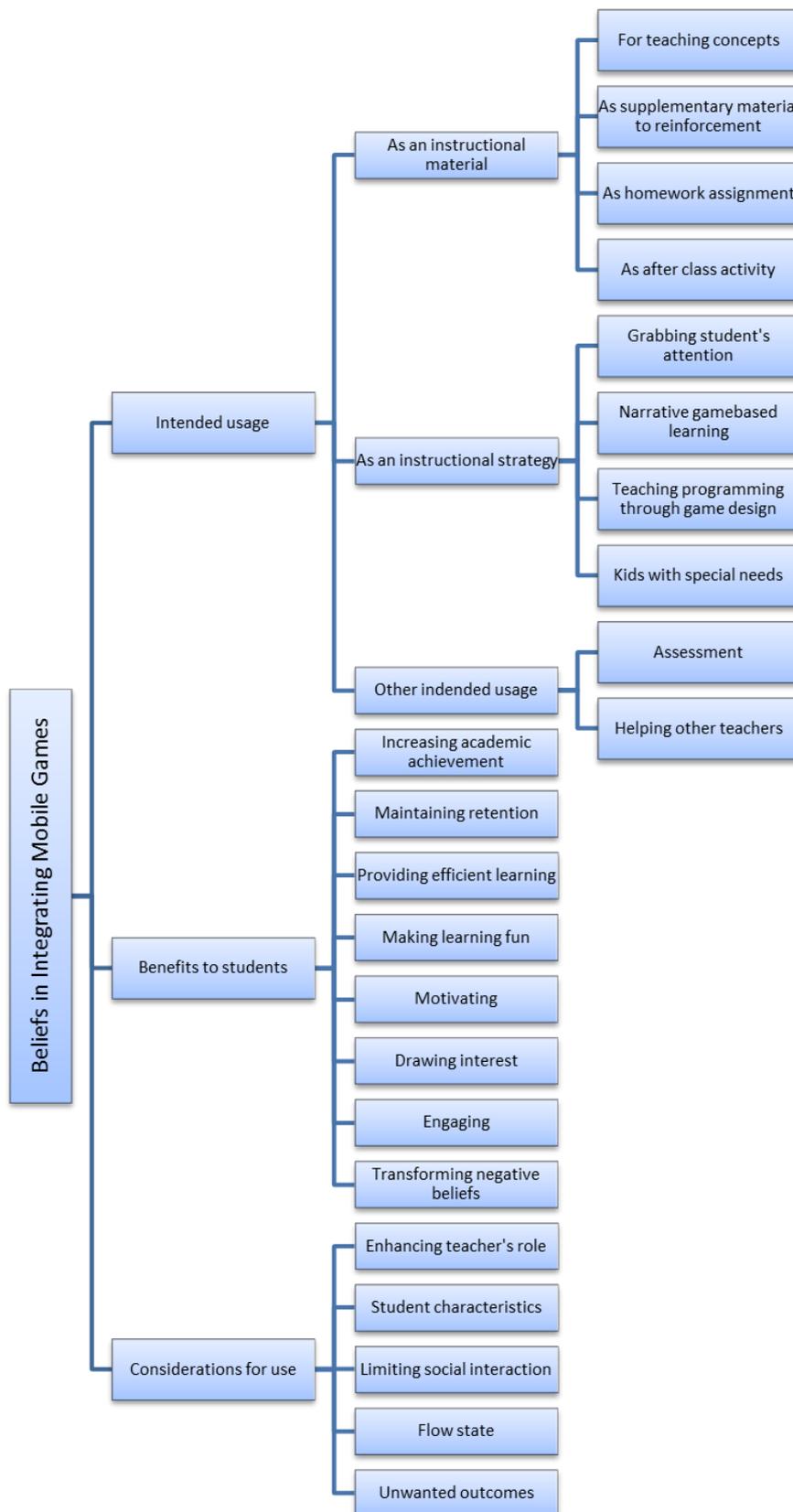


Figure C.2 Codes and Themes for Beliefs in Integrating Mobile Games

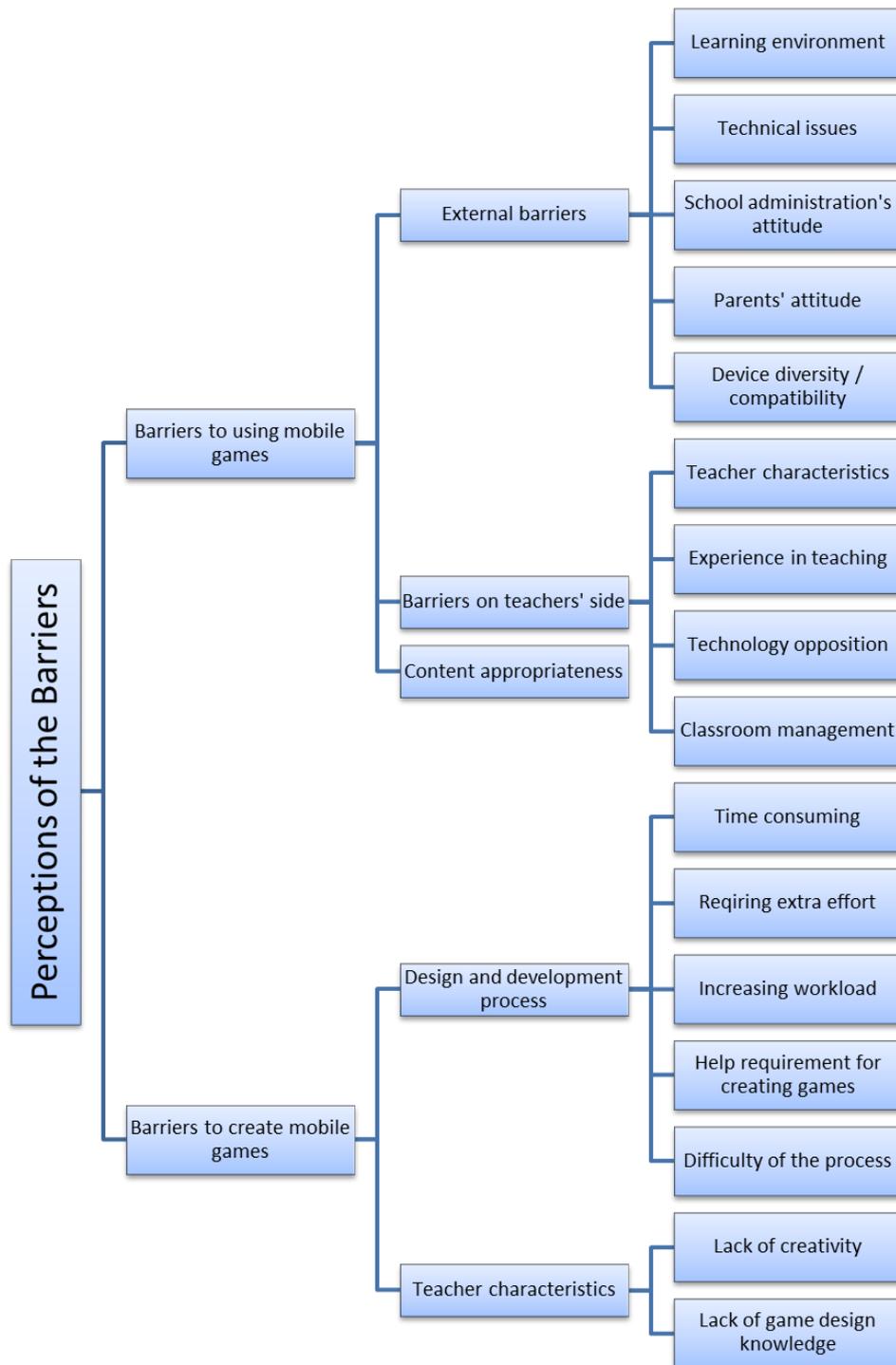


Figure C.3 Codes and Themes for Perceptions of the Barriers

APPENDIX D

MINI-GAME PROJECTS OF THE PARTICIPANTS

Table D.1 Mini-Game Projects Submitted by the Participants

P #	Mini-Game Name	Description	DOI Link
P1	Get to School	There is a character which is controlled by the player. The character tries to get to the school while preventing from falling into holes on the way. Level: Kindergarten	http://dx.doi.org/10.6084/m9.figshare.1540784
P2	Farm Animals	The player tries to match the animals and animal shades appear in the frame. Level: Kindergarten	http://dx.doi.org/10.6084/m9.figshare.1540786
P3	Fallen Apples	Counting game. There is a tree with many apples on it. The player shakes the device in order to drop the apples down. The number of fallen apples is required to be entered correctly to win the game. Level: Kindergarten	http://dx.doi.org/10.6084/m9.figshare.1540814
P4	Linguistics	The player drags and drops the phonetic symbols on associated spots of mouth and throat. The game is incomplete.	http://dx.doi.org/10.6084/m9.figshare.1540795
P5	Feed Scrat	The character "Scrat" is hungry. The player is required to collect enough amount of acorns for him. Game promotes addition operation. Level: Elementary	http://dx.doi.org/10.6084/m9.figshare.1540785
P6	One	A set of numbers and operations appear on the screen. The player is required to reach the number "1" by operating them.	http://dx.doi.org/10.6084/m9.figshare.1540768
P7	Matching letters	The player drags and drops the images of objects onto the associated letter which is the first letter of the object. Level: Kindergarten	http://dx.doi.org/10.6084/m9.figshare.1540792
P8	Outsider Animal	The player is supposed to locate the animals and plants which do not belong to the ecosystem in a certain amount of time. Level: Elementary	http://dx.doi.org/10.6084/m9.figshare.1540773
P9	Letters	The player needs to enter the first letter of the name of the animal that appeared on the screen. The name is also audible. Level: Kindergarten	http://dx.doi.org/10.6084/m9.figshare.154077

Table D.1 Mini-Game Projects Submitted by the Participants (Continued)

P10	Numbers	The player is expected to recognise the numbers 0-9. Level: Kindergarten	http://dx.doi.org/10.6084/m9.figshare.1540769
P11	Yet Another Typing Game	The player controls a character and collects the food in a certain order to build a grammatically correct English sentence without hitting the borders and barriers. A grammar rule is given at the end of each level.	http://dx.doi.org/10.6084/m9.figshare.1540769
P12	Guess the Scientist	Player is given a set of hints about the scientist and required to enter the scientist's name to win the game. Level: Elementary.	http://dx.doi.org/10.6084/m9.figshare.1540775
P13	Traffic	The player tries to hit the targets with a ball. Everytime he hits, he is given a traffic rule. Level: Elementary	http://dx.doi.org/10.6084/m9.figshare.1540778
P14	Flag Quiz	A quiz to practice the flags of countries.	http://dx.doi.org/10.6084/m9.figshare.1540787
P15	Jungle	A quiz type game where the player decides which animal belongs to what class. Level: Elementary	http://dx.doi.org/10.6084/m9.figshare.1540783
P16	Numbers	The player is expected to recognise the numbers 0-9. Level: Kindergarten	http://dx.doi.org/10.6084/m9.figshare.1540782
P17	lol	The player is required to enter the word he's hearing. There are 3 difficulty levels as 1 syllable words, 2 syllable words and 3 syllable words. Level: Any English learner.	http://dx.doi.org/10.6084/m9.figshare.1540781
P18	Q&Puzzle	Quiz type game where the player gets to solve a jigsaw puzzle to compensate his wrong answers.	http://dx.doi.org/10.6084/m9.figshare.1540780
P19	Cell Quiz	A quiz where the player is supposed to recognise the organelle of the cell. Level: Elementary	http://dx.doi.org/10.6084/m9.figshare.1540779
P20	Jelly Lab	The player needs to smash jellies in time. There is no particular educational purpose in this game.	http://dx.doi.org/10.6084/m9.figshare.1540809

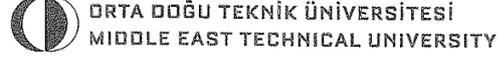
Table D.1 Mini-Game Projects Submitted by the Participants (Continued)

P21	Food Chain	The player puts the food in the correct order according to the food chain. Level: Elementary	http://dx.doi.org/10.6084/m9.figshare.1540777
P22	Quiz-Mammals	The player is asked questions about the features of Mammals.	http://dx.doi.org/10.6084/m9.figshare.1540776
P23	Color Match	The player matches the correct color with the objects on the screen.	http://dx.doi.org/10.6084/m9.figshare.1540774
P24	Color Match	The player matches the correct color with the objects on the screen.	http://dx.doi.org/10.6084/m9.figshare.1540793
P25	Addition	Addition operation game.	http://dx.doi.org/10.6084/m9.figshare.1540772
P26	Animal Quiz	The player is supposed to name the animal correctly. Level: Kindergarten	http://dx.doi.org/10.6084/m9.figshare.1540771
P27	Food Groups	The player is required to group the foods correctly in time. Level: Elementary	http://dx.doi.org/10.6084/m9.figshare.1540770

APPENDIX E

ETHICS COMMITTEE OF MIDDLE EAST TECHNICAL UNIVERSITY RESEARCH CENTER FOR APPLIED ETHICS APPROVAL FORM (TURKISH)

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
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21 Mayıs 2015

Gönderilen : Y.Doç.Dr.Göknur Kaplan Akıllı
Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü

Gönderen : Prof. Dr. Canan Sümer
IAK Başkan Vekili

İlgi : Etik Onayı

Danışmanlığını yapmış olduğunuz Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü Yüksek Lisans öğrencisi Merve Güleroğlu'nun "**Perceptions of Pre-service Teachers towards the Use of Mobile Educational Games**" isimli araştırması "İnsan Araştırmaları Komitesi" tarafından uygun görülerek gerekli onay verilmiştir.

Bilgilerinize saygılarımla sunarım.

Etik Komite Onayı

Uygundur

21/05/2015

Prof.Dr. Canan Sümer
Uygulamalı Etik Araştırma Merkezi
(UEAM) Başkan Vekili
ODTÜ 06800 ANKARA

APPENDIX F

PERMISSION FOR THE INSTRUMENT

The screenshot shows a LinkedIn message thread. On the left is a sidebar with 'All Messages' and a search bar. A message from Joy Bensiger is visible, dated Jul 13, with the text 'You: Hello again, I have collected my data. Howev...'. The main part of the screen shows a conversation with Joy Bensiger, Educational Technology Specialist, dated Apr 2. The message is in a blue bubble and contains the following text:

Dear Dr. Bensiger,

I am a master's student at the Department of Computer Education and Instructional Technology in Middle East Technical University, Turkey.

I would like your permission to use the survey you designed for your PhD dissertation "Perceptions of Pre-service Teachers in Using Video Games as One of Their Teaching Tools". I assure you that I will only use it for my research study, and not for any commercial purpose. I also guarantee that I will use it within academic ethical standards.

My research is about pre-service teachers' experiences in design and development process of a mobile game, and their perceptions towards game use in their future practice. I have been looking for an instrument that could help me explore pre-service teachers' current gaming experiences, their awareness about the potential of educational video games, and their willingness of using a video game in their classroom. I found your PhD. Dissertation very helpful in this context. The survey you designed looks like the perfect fit for my study to collect necessary data.

I have tried to contact you via e-mail a few times earlier, however I did not get a response. That is why I am sending this message through LinkedIn now. I apologize if I caused any inconvenience.

Kind regards,
Merve Güleröğlü

The timestamp '9:36 PM' is visible at the bottom right of the message bubble.

Below this, a response from Merve Güleröğlü is shown in a grey bubble, dated Apr 3. The text of the response is:

Hi Merve,

Sorry I couldn't respond to you sooner. Please go ahead and use the survey.

Good luck with your masters project.

Best,
Joy Bensiger

Sent from LinkedIn for iPad
<http://lnkd.in/ios>

The timestamp '2:58 PM' is visible at the bottom left of the response bubble.

At the bottom of the screen, there is a text input area with the placeholder 'Click here to [reply](#) or [forward](#)'. Below the input area are icons for adding photos, attachments, emojis, and a checkbox labeled 'press enter to send'.