A STUDY OF PRESERVICE TEACHERS PERCEPTIONS OF THEIR
PREPAREDNESS LEVELS ON LEARNING AND INNOVATION SKILLS
IN A RESEARCH UNIVERSITY

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Approval of the Graduate School of Social Sciences

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ABSTRACT

A STUDY OF PRESERVICE TEACHERS PERCEPTIONS OF THEIR
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IN A RESEARCH UNIVERSITY

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The purpose of the present study was to investigate preservice teachers' perceptions of their preparedness levels on learning and innovation skills (creativity and innovation - CI, critical thinking and problem-solving - CP, collaboration - CL, and communication - CM). The study employed a survey design and was composed of two consecutive phases.

Phase I aimed to find out indicators for the learning and innovation skills based on preservice teachers' self-reports utilizing an open-ended survey, OHILIS, to develop the quantitative survey instrument, named PLeSLIS. Phase II aimed to estimate preservice teachers' preparedness levels from their perspectives utilizing PLeSLIS. While the study included 54 junior students in Phase I, the sample size consisted of 205 senior students in Phase II from the faculty of education at an English-medium research university in Turkey.

From Phase I, a cultural misconception on innovation and a lack of systematic approach to problem-solving were found. Additionally, limited knowledge of the

terms innovation and critical thinking was reported by a few preservice teachers. From Phase II, insignificant interdepartmental differences on preparedness levels were found. Furthermore, it was found that senior female preservice teachers considered themselves significantly more prepared than males in terms of CI and CP.

Ultimately, to prepare teachers for learning and innovation skills and minimalize the reported significant differences on preparedness levels, the teacher education programs might take action to provide their preservice teachers with informative seminars, workshops and events on 21st Century movement and competencies. In this manner, their knowledge and experiences might be enhanced.

Keywords: Teacher Education, Learning and Innovation Skills, Preparedness Level, Preservice Teachers

ÖZ

BİR ARAŞTIRMA ÜNİVERSİTESİNDEKİ ÖĞRETMEN ADAYLARININ ALGILARINA GÖRE ÖĞRENME VE İNOVASYON BECERİLERİNE HAZIRBULUNUŞLUK SEVİYELERİNİN İNCELENMESİ

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Bu çalışmanın amacı, öğretmen adayları bakış açılarından öğretmen adaylarının öğrenme ve inovasyon becerileri (yaratıcılık ve inovasyon - Yİ, eleştirel düşünme ve problem çözme - EP, işbirlikçilik - İŞB, ve iletişim - İLET) üzerine hazırlıkbulunuşluk seviyelerini incelemektir. Bu çalışma tarama deseni ile tasarlanmıştır ve iki ardışık aşama içermektedir.

Birinci aşamanın amacı PLeSLIS isimli nicel bir anketin geliştirilmesi için OHILIS isimli nitel bir anketi kullanarak öğrenme ve inovasyon becerilerinin göstergelerini öğretmen adaylarının algılarına dayalı olarak oluşturmaktı. İkinci aşamanın amacı ise PLeSLIS'i kullanarak öğretmen adaylarının bakış açılarından onların hazırbulunuşluk seviyelerini hesaplamaktı. Birinci aşama Türkiye'deki eğitim dili İngilizce olan bir araştırma üniversitesinin eğitim fakültesinde okuyan 54 3. sınıf öğrencisiyle, ikinci aşama ise 205 son sınıf öğrencisiyle gerçekleştirildi.

Birinci aşamada, inovasyon terimi üzerine kültürel kavram hatası ve problem çözmeye sistematik yaklaşım eksikliği bulundu. Ayrıca, birkaç öğretmen adayının

inovasyon ve eleştirel düşünme terimlerine yönelik bilgilerinin kısıtlı olduğunu bulundu. İkinci aşamada, istatistiksel olarak anlamlı olmayan hazırbulunuşluk seviyelerindeki bölümlerarası farklılıklar ortaya çıkarıldı ve tartışıldı. Buna ek olarak, kadın öğretmen adaylarının kendilerini erkek öğretmen adaylarından Yİ ve EP becerilerinde anlamlı düzeyde daha hazırbuldukları ortaya çıktı.

Sonuç olarak, öğretmen adaylarını öğrenme ve inovasyon becerilerine hazırlamak ve bahsedilen anlamlı düzeydeki farklılıkları azaltmak için, öğretmen eğitimi programları 21. Yüzyıl akımı ve yeterlikleri konusunda bilgilendirici seminerler, çalıştaylar ve etkinlikler düzenleyebilirler. Bu şekilde, öğretmen adaylarının konu üzerindeki bilgi ve tecrübelerini arttırılabilirler.

Anahtar Kelimeler: Öğretmen Eğitimi, Öğrenme ve İnovasyon Becerileri, Hazırbulunuşluk Seviyesi, Öğretmen Adayı

To my beloved parents;

Şengül & Ali Erer

for their endless support and encouragement

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LIST OF ABBREVIATIONS

AA	Audience Analysis
AL	Active Listening
CE	Creation and Evaluation
CEIT	Computer Education and Instructional Technology
CHED	Chemistry Education
CI	Creativity and Innovation
CL	Collaboration
CM	Communication
CoHE	Council of Higher Education
CP	Critical Thinking and Problem Solving
CT	Convergent Thinking
DT	Divergent Thinking
ECE	Early Childhood Education
EFA	Exploratory Factor Analysis
EME	Elementary Mathematics Education
EQF	European Qualification Framework
ESE	Elementary Science Education
EU	European Union
FLE	Foreign Language Education
IM	Interpersonal-Management
ISTE	International Society for Technology in Education
L	Leadership
MANOVA	Multivariate Analysis of Variance
MHED	Mathematics Education
MoNE	Ministry of National Education
OECD	Organization for Economic Cooperation and Development
OHILIS	Opinionnaire Hunting Indicators of Learning and Innovation Skills

P21	Partnership for 21st Century Learning
PHED	Physics Education
PLeSLIS	Preparedness Level Survey on Learning and Innovation Skills
SAA	Systems and Argument Analysis
TQF	Turkish Qualification Framework

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.

- Alvin Toffler

As Toffler touched upon, expectations from 21st century citizens have changed. A contemporary individual in the current era is expected to adapt to major alterations occurring in every aspects of life. For such an adaptation, individuals require some specific skills. While alterations in social and economic systems have polished the importance and merit of the specific skill set, the responsibility of transmitting them to citizens of tomorrow have naturally been on education through teachers.

The transition to the 21st century has risen the focus on the notion of the knowledge society. The term, knowledge society, refers to a society "in which ideas and knowledge function as commodities" (Anderson, 2008, p. 6). Thanks to innovations in information and communication technologies, improved features of communication such as quicker access to knowledge have triggered a global change. Accordingly, contemporary nations with ICT infusion during the end of the 20th century have begun to convert into knowledge societies (Vallima & Hoffman, 2008). Through the conversion into a knowledge society, social institutions such as economy and education have also gone under the influence. Consequently, a reconsideration in attributes of human capital under economy and, in return, discussions on curriculum under education have risen.

The alteration in economic structures towards the knowledge economy resulted in modifications of the terms defining skills in the 21st century for employability, citizenship and self-actualization (Dede, 2010; Bellanca, 2010). The business sector in knowledge economy started looking for skilful knowledge-workers since the way citizens work has also shifted (Hilton, 2008). As an example, for this era, diversely-gathered teams are formed in working environments equipped with the latest technological advances to cope with frequently ill-defined problems affecting institutions (Griffin, Care & McGaw, 2012). As a consequence, expected skill sets of a citizen has changed and business sector pointed demands on educational programs to raise citizens with the new description of knowledge workers.

The expectations from education have elevated the everlasting discussions among two different approaches to the curriculum (Bridges, 2000). While one approach advocates curriculum as a "a given body of knowledge" apart from the influences of other social institutions, another views it as a means that is supposed to respond to the needs of demanding economy in favor of learners' survivability in economy through employability (Moore & Young, 2001; Scott, 2006). Still, international governmental collaborations including Turkey on educational policy such as Bologna declaration have embraced the latter approach to keep societies functioning both in national and international stages (Karseth, 2008). Although such collaborations arose to agree upon a consensus in educational policies in the new century, another agreement on which skills to include as key curricular outcomes to raise skillful citizens for the 21st century was also needed.

To decide upon which curricular outcomes should be considered as essentials and included in national curricula, various organizations around the world, such as Partnership for 21st Century Learning, Organization for Economic Cooperation and Development or OECD and European Union as well, have gathered up (Chu et al., 2017; Voogt & Roblin, 2012). As a result, all developed frameworks from previously mentioned organizations essentially pointed towards one overarching skill set: learning and innovation skills (Voogt & Roblin, 2012) or, in other words, 4Cs as

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essentials for 21st century learners and citizens. For that reason, the skill set has quickly become cardinal components respectively in the development of European Qualifications Framework proposed in 2006 (European Commission, 2008), and Turkish Qualification Framework in 2007 (CoHE, 2007). Moreover, the same skill set has also taken its place in Turkey's teacher competencies published in 2006 and 2017 and disseminated to faculties of education to align their teacher education curricula accordingly. Consequently, learning and innovation skills have been in the focus of both international and national frameworks of learning outcomes not only for 21st century citizens but also for 21st century teachers.

As a core skill set, learning and innovation skills have been emphasized as the essentials in the skill palette of teachers in the 21st century. In that sense, Global Education report published by Partnership for 21st Century Learning underlines that societies becoming inevitably more international, interdependent and diverse hold an expectation now from teachers to possess global competencies such as thinking critically and creatively and working collaboratively with global communication skills (P21, 2014). Creativity and innovation in education have become a necessity in knowledge societies (Ferrari, Cachia, & Punie, 2009). Since the way of learning and even understanding is different for the new generation (Ala-Mutka, Punie, & Redecker, 2008), teachers must use their creative and innovative thinking abilities more than ever to draw their students' attention on learning activities (Beghetto, 2005). Critical thinking and problem-solving are also among these global competencies demanded from teachers to possess in the current century. Since nations have become more and more international, culturally diverse and interdependent, the real-life issues that both teachers and students face in and out of learning environments now require the utilization of these higher order thinking skills more than ever (Solon, 2007). Collaboration and communication are undeniably the consistent features of the teaching profession (Darling-Hammond, 2006). While the former is required in all learning and working environments both by all individuals including teachers (OECD, 2013), mastery in the latter helps individuals have lucrative and vigorous intrapersonal and interpersonal relationships (Barker, 2006). In conclusion, teachers must first

possess these skills so they can prepare youth for everchanging situations of the current century.

All in all, the teaching profession has the power to impact the next generation and teachers prepare citizens of tomorrow for the society. In that sense, it is important to ensure teachers of tomorrow gain global skills demanded by the knowledge society. Moreover, ensuring such a transmission of the skills to prospective teachers during their preparation years provides various benefits not only with stakeholders in educational policy making but also with the future of government and society. Therefore, this research is an academic attempt to examine preservice teachers' preparedness levels on the previously mentioned skill set.

1.2 Purpose of the Study

Raising global citizens for the world is among the main missions of education (Balistreri, Di Giacomo, Noisette & Ptak, 2012). It is especially crucial in the 21st century when it is considered that societies are now becoming inevitably more international, interdependent and diverse (P21, 2014). Hence, a portion of this duty has increasingly and heavily been on teachers' shoulders. Extremely, this duty has been underlined by some researchers (Berry, 2010; Castells 2010) as education covers a responsibility on preparing global and conscious citizens who are ready to survive in the 21st century (Chu et al., 2017). However, approaching from such a point of view may result in underestimation of a need to perceive the issue from teacher educators' stances. In other words, it is crucial not to miss the point of which teachers ought to possess the demanding competencies or skills that they are expected to transfer to raise the global citizens of tomorrow. Said that, the integration of 21st century skills into teacher education programs in order to enable them to become and raise citizens for this era has been emphasized both in international and national levels.

Distinctively, the collaboration of the American Association of Colleges for Teacher Education (AACTE) and the Partnership for 21st Century Learning have gathered up to address this issue and their consensus has yielded some core principles for the

integration of 21st-century skills into teacher education programs (Greenhill, 2010). Furthermore, as Greenhill (2010) asserts, while teacher education programs are globally expected to prepare teachers of tomorrow to possess beside to teach and assess those demanding skills, teachers in the 21st century needs to be raised as change agents. On the other hand, which skill set teacher preparation programs are required to transfer has potential especially to enable preservice teachers as future change agents have been an essence of discussions for a while. Hereof, Partnership for 21st Century Learning proposes a good solution with a highlight on the skill set called learning and innovation skills since the mastery on the mentioned skill set have been perceived as a good predictor of a successful 21st century citizen who can cope with constantly changing situations around (Chu et al., 2017).

Specifically, Turkey has also taken action to determine competencies and align teacher education programs with them to enable the teaching profession's compatibility with the 21st century movement (MoNE, 2017). These national actions have induced different governmental studies on either determination or revision of Turkey's teacher competencies in 2002, 2006 and 2017. Still, all documents have commonly highlighted the importance of equipping teachers with learning and innovation skills or 4Cs. To be more explicit, the learning and innovation skills have been considered relating to personal development of teachers (MoNE, 2006). Moreover, the documents have underlined that teachers in Turkey are expected to possess and use 4Cs in order to transfer them to their students (MoNE, 2006). Furthermore, the document published in 2017 highly emphasized Turkey's ongoing aim to raise 21st century citizens with learning and innovation skills and the place of teacher education in achieving such an aim (MoNE, 2017). Apparently, not only the skills expected of citizens in Turkey have changed along with the 21st-century movement, but also the skills which 21st-century teachers are supposed to possess have gone under the influence both in national and international levels. Considering that, teacher education programs in Turkey has been expected to prepare their students to the teaching profession in 21st century.

As a matter of fact, not all teacher education programs have produced graduates with the same level of preparation for the profession and its requirements and demands in the time (Darling-Hammond, 2006; Darling-Hammond, Chung, & Frelow, 2002; Darling-Hammond, 1997). For that reason, another preponderant concern in the field of teacher education is an evaluation of teacher education programs with regards to their alignment to 21st-century subjects, themes and skills. So far, while the abundance of global research has carried out to assess whether in-service teachers are being equipped with 21st-century skills, there happened a few studies examining the issue in the preservice level (Urbani, Roshandel, Michaels & Truesdell, 2017). Moreover, while Richardson (2005) accentuates the importance of utilizing student evaluations and feedback to improve educational programs, Eret-Orhan, Ok and Capa-Aydin (2017) pointedly address a continuous need for an up-to-date examination of preservice teachers' perspectives on their education to supply stakeholders of teacher education programs with valuable research findings to facilitate decision making in curriculum improvement and implementation.

Taking all advice and suggestions mentioned into the account, it is evident that teacher educators shall not avoid consulting to preservice teachers' perspectives on the evaluation of their teacher preparation programs. Rather, it is better to employ their feedback in attempts to improve the educational service that they consume. In times of uncertainty and constant change in each institution of society, future change agents of societies, or teachers of tomorrow, need to be at least adequately equipped with an essential skill set which is demanded by the century. For this research, the demanded skill set, or 21st Century Learning and Innovation skills or 4Cs, according to Partnership for 21st Century Learning, involves creativity and innovation, critical thinking and problem solving, collaboration, and communication. Moreover, they are the essential skills since they are to "separate students who are prepared for increasingly complex life and work environments in the 21st century, and those who are not" (Partnership for 21st Century, 2016, p. 37). To ensure successful transmission of those skills to the younger generation through educational programs, it must first be assured that teacher education programs adequately convey them to teachers of

tomorrow who are currently in faculties of education. Since as future role-models of youth, preservice teachers should possess those essentials. All in all, the purpose of this research is mainly to reveal preservice teachers' perceptions of their preparedness levels on learning and innovation skills. In that sense, preservice teachers in a prestigious state research university located in the northwestern part of central Anatolia region of Turkey were asked to rate the extent to which their teacher education programs contribute to their acquisition of skill indicators relevant to 21st-century learning and innovation skills.

1.3 Research Questions

The purpose of the present study is to investigate preservice teachers' perceptions of their preparedness levels on learning and innovation skills in a state university. Therefore, the detailed aims of this study are (1) to identify indicators of learning and innovation skills from preservice teachers' perspectives, (2) to determine their preparedness levels on learning and innovation skills, and (3) to investigate possible statistically significant differences in preparedness levels in terms of individual factors such as gender and department. In that sense, the aims will be probed under the following research questions:

1. What indicators explain the 21st-century learning and innovation skills from the perceptions of preservice teachers in a research-university?

2. To what extent does the teacher education program offered in the research-university prepare future teachers to possess the 21st-century learning and innovation skills based on preservice teachers' perceptions?

3. Are there significant differences in the extent the teacher education program prepares future teachers to possess the 21st-century learning and innovation skills in terms of gender and department?

1.4 Significance of the Study

When it is considered that there are more than one million teachers teaching approximately 18 million students at over sixty-five thousand K12 schools (Council of Higher Education, 2018), teacher education can be considered as a backbone of national education in Turkey. So far, under Council of Higher Education (CoHE)'s considerations, teacher education programs have been revised with intentions on improvement over both teacher education curricula and the teaching profession in years 1997, 2006 and 2018. Lately, the importance of learning and innovation skills has been once more apparent in the General Competencies for Teaching Profession Report published in 2017 that "Turkey aims to raise generations equipped with the 21st -century skills namely complex problem solving, critical thinking, innovative production, effective communication, and high-level cooperation" (Ministry of National Education, 2017, p. 6). Moreover, the report is utilized in the design of the latest teacher education programs which have come to effect starting from the 2018-2019 academic year (Council of Higher Education, 2018). From that perspective, this study carries a potential to reveal the current state on the extent the teacher education programs at the prestigious state research university prepare future teachers to equip learning and innovation skills from their students' perceptions. Moreover, when the latest changes in teacher education programs are taken into account, the study can be easily turned into longitudinal research to assess the result of this latest policy change.

On the other hand, the research also contributes to the field of teacher education and to the related literature. Knowing that there have been various studies examining each 21st-century skill from diverse perspectives such as qualitative assessments of conceptualization of the skills (Ammentorp & Madden, 2018; Bal-İncebacak, Sarışan-Tungaç, & Yaman, 2018; Çakmak, Budak & Kayabaşı, 2018; Davis, Hartshorne & Ring, 2010; Erdamar & Demirel, 2010; Gentry, 2012; Kanik, 2010; Kaufman, 2006; Schreglmann & Kazancı, 2016; Son & Lee, 2016; Tok, 2015) and quantitative studies on the skill levels of preservice teachers (Akça & Şakar, 2017; Baykara-Pehlivan, 2005; Çetinkaya, 2011; Demiral, 2018; Elkatmış & Ünal, 2014; Erdem & Yazıcıoğlu,

2015; Gülveren, 2007; Kutluca, 2018; Milli & Yağcı, 2017; Ocak & Erşen, 2015; Örün, Orhan, Dönmez & Kurt, 2015; Tan & Tan, 2016; Temizkalp, 2010; Topoğlu, 2015; Yiğitcan Nayir & Tekmen, 2017), this research mainly investigates preservice teachers' perceptions of their preparedness levels on learning and innovation skills as a compact study, or in other words all four skills at once. Explicitly, the findings of each indicator on each domain of the skill set for every department enable teacher educators in related programs to check on the current status of their preservice teachers' preparedness levels. In that sense, revealing preparedness levels of preservice teachers on these crucial skills not only provide stakeholders of teacher education programs with valuable data to make more professional decisions on curriculum improvement and implementation accordingly, but also contribute to the field of teacher education with possible significant findings between estimated preparedness levels and other variables that will be shared in academic publications resulted from this study.

1.5 Definitions of Terms

Preparedness Level: For this study, the notion of the preparedness level refers to the estimated extent of which teacher education programs transfer the learning and innovation skills to their preservice teachers from their perceptions.

Competency: A competency refers to "integrated pieces of knowledge, skills and attitudes that can be used to carry out a professional task successfully" (Baartman & De Bruijn, 2011, p.127).

Skill: "The ability to do something well; expertise" or "a particular ability" (Oxford Dictionary, n.d.)

Skill set: A group of skills.

Learning and Innovation Skills: The present study utilizes the Partnership for 21st Century Learning's conceptualization of learning and innovation skill set (P21, 2014).

Therefore, this skill set encompasses creativity and innovation, critical thinking and problem solving, collaboration, and communication.

Creativity and Innovation: For the current study, creativity and innovation are considered as contextually and mutually complementary. In that sense, creativity is defined as "an ability to produce novel and useful ideas [which] not only are original and make a unique contribution to the field but also serve some purpose or fulfil some need" (Lai et al., 2018). Meanwhile, innovation is considered as a successful utilization or application of a creative solution or product (Amabile & Pillemer, 2012).

Moreover, the construct validity of the developed questionnaire called PLeSLIS indicated that creativity and innovation are assessed under two domains; *divergent thinking* and *convergent thinking*. From the connected models of thinking approach (Guilford, 1967), while divergent thinking is suggested as a valid predictor for creativity, convergent thinking is proposed as an indicator of innovation (Wright, Lewis, Skaggs, & Howell, 2011).

Critical Thinking and Problem Solving: In the present study, critical thinking is considered as a versatile skill which substantially employs problem-solving ability whenever available information is vague (Ventura, Lai, & DiCerbo, 2017). In that sense, critical thinking refers to an overall ability encompassing logical thinking, argumentation, decision making and problem-solving (Butler et al., 2012; Halpern, 2003; Ventura, Lai, & DiCerbo, 2017).

Moreover, the construct validity of the developed questionnaire named PLeSLIS indicated that critical thinking and problem-solving are assessed under two domains; *systems and argument analysis* and *creation and evaluation*. Systems and argument analysis refer to identifying and determining the relationships between variables to understand a system and correspond to drawing logical conclusions based on data or claims. Creation and evaluation refer to the creation of a strategy, theory, method, or argument based on a synthesis of evidence, and the artefact that is going beyond the

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information at hand and involves not only a judgement of the quality of them but also criticism about them using a set of standards or specific framework.

Collaboration: The term collaboration in the research corresponds to an ability to interact with individuals in order to work together toward a common goal (Lai, DiCerbo & Foltz, 2017).

However, the construct validity of the developed questionnaire, PLeSLIS, indicated that collaboration is assessed under two domains; *interpersonal management* and *leadership*. In that sense, interpersonal-management as a domain of collaboration covers conflict resolution, goal-setting, performance management and personal planning (Lai, DiCerbo & Foltz, 2017). On the other hand, the leadership domain encompasses particular aspects of collaboration such as task coordination, construction and management of group dynamics (Lai, DiCerbo & Foltz, 2017).

Communication: The term communication in the present study refers to an ability to engage in "a social process in which information is exchanged in order to establish shared meaning and to achieve desired outcomes" (Metusalem, Belenky & DiCerbo, 2017, p. 5).

However, the construct validity of the developed questionnaire called PLeSLIS underlined that communication is assessed under two domains; *active listening* and *audience analysis*. The former refers to reception skills of communication such as paying attention, avoiding judgement, asking for clarifications, and clearly summarizing (Metusalem, Belenky & DiCerbo, 2017). The latter corresponds to production skills of communication such as modelling receiver's emotions, expectations and mind, reflecting understanding, and selecting the most appropriate channel for transmission of meaning in order to create messages in a way that satisfies receiver's expectations from communication.

CHAPTER 2

LITERATURE REVIEW

This chapter introduces the related literature within the framework of the research interest. To begin with, historical background of 21st-century competencies is presented. Then, education in the 21st century and attributes of 21st-century competencies are discussed. Following that, educational challenges and developed frameworks are explained. Moreover, each skill in the learning and innovation skill set are explained. In the end, a compilation of relevant studies on each skill in and outside of Turkey is presented.

2.1 Functionalist View

Each new generation is reared by its predecessor; the latter must therefore improve in order to improve its successor. The movement is circular.

-Emile Durkheim

According to a prominent French sociologist, Emile Durkheim (1956), functionalism is "a school of thought that seeks to explain social phenomena in terms of how the survival needs of society are served" (p.45). In that sense, social institutions, such as family, economy, and education, are the pillars of society as they function to respond to its 'survival needs'. Therefore, from a functionalist approach, a society flawlessly endures through time as long as a balance between its every social institution has been stabilized (Ainsworth, 2013). Particularly, education is considered among a few social institutions with the utmost importance. Within the paradigm, the reason behind its importance roots at the fact that while a surviving society demands not only individuals

with different levels of skills and knowledge (*role differentiation*) but also some degree of social acceptance for these role distributions (*social solidarity*), education as an institution contributes to role differentiation as developing individuals' human capital and ensures social solidarity in a society as it establishes a structure (*schooling*) in which individuals in a way have a chance to choose their roles in the system (Durkheim, 1956).

Such power comes with great responsibilities. In that sense, education, which is considered as an institutional bridge between family and work, plays crucial roles in individual development and therefore possesses its own roles. As one of its manifest functions or primary roles, socialization is served to individuals inside the package of schooling. The service refers to an opportunity of which students going through a schooling system experience social roles, learn social values and norms, gain knowledge and skills, and develop attitudes with and within a community (OpenStax College, 2015). Starting from the very beginning; primary education, schooling equips citizens of tomorrow with most fundamental skills: 3Rs (reading, writing, and arithmetic) (Russell, 2013). Incrementally developing individuals thorough schooling, education in this view prepares citizens for the market. Yet, such a main aim and concentration do not detract education from its purpose on cognitive and affective development on citizens; instead, it aims to rear productive and participatory citizens for society (Bills, 2004). Therefore, a change in demands by any social institution does not remain unanswered by education.

2.2 History of Competency-Based Education

Following Durkheim's prominent proposition of such a theory on how societies endure through time, the nations were ironically about to go through a though era with two main historical cases; the proliferation of industrial age in the final half of the 19th century and the start of the devastating first world war during the first half of the 20th century. According to Brown (1994), these unfortunate years caused the formation of a basis for competency-based education. In fact, starting from this era, the rise of

competency-based education experienced its development in five consecutive stages or, as Brown called 'generations' (Brown, 1994; Ford, 2014).

The birth of the competency-based education started with societies demands and efforts through developed training to raise skillful workers who can participate in the lately industrialized economy. However, altering powers among nations through industrialization was about to result in an unforgettable massive war. Unfortunately, the first world war mainly lasted four years and resulted in 20 million deaths and 21 million wounded worldwide so the participative nations started seeking solutions to recover the loss of the historical devastation (Mougel, 2011). In that sense, the continuing application of competency-based education as training responded these demands to quickly raise farmers in wounded nations, which was the milestone of such an educational approach (Brown, 1994) and as a good example of a functionalist view in the role of education.

The second stage in competency-based education initiated with the inclusion of feedback in learning, or mastery learning (Brown, 1994). This method of teaching and learning firstly introduced in studies of Washburn and Morrison in the 1920s as achieving a level of success or mastery on content without depending on a curricular time. However, implementation of the method between the 1920s and 1930s required more effort from educators due to the time each learner spends in the way to mastery and, therefore, could not expand even outside of some states in the united states of America (Motamedi, 2017).

The third stage of competency-based education corresponded to the intersection of psychology and education; specifically, in the design and practice of vocational education and training programs (Brown, 1994; Ford, 2014). Moreover, this interaction was strengthened with a period of another approaching world war due to governments' demands and use of education in training soldiers. In that sense, Skinner's prominent contributions to the field of educational psychology and the rise of instructional technology with programmed instruction (Skinner, 1957) and teaching machine (Skinner, 1957) enhanced the development of competency-based education.

The fourth generation or stage was an influential one due to its association with teacher training programs (Ford, 2014). This stage of competency-based education mainly designated with the emergence of behavioural objectives (Brown, 1994). Moreover, according to Brown (1994), Robert Mager's contribution with his remarkable publication called "Preparing instructional objectives" provided the field of education with three essential components of a behavioural objective while designing and developing curriculum. These were a performance which learners demonstrate after the instruction is completed, a standard which is basically a level of mastery that learners should achieve as a minimum, and conditions as a list of instructional materials included in instruction (Mager, 1962). Furthermore, the developed and explicit understanding of human learning through educational psychology resulted in a teacher education movement and the development of "performance-based teacher training" (Brown, 1994, p.10). Additionally, the word "competency" was first derived through these teacher training programs (Ford, 2014).

In the fifth stage of competency-based education corresponding to 1980s and 1990s, curriculum developers started focusing more on outcomes associated with the awarded job title following successful completion of an educational program (Brown, 1994). After the start of this stage, curriculum developers were assigned a responsibility to comprehend what is required and demanded from a graduate of each specific job title so they could develop curriculum responding to the demands of market and society in time. Therefore, improvement and enhancement efforts in higher education curriculum started to include a competency-based approach by embedding mostly desired and required competencies encompassing subject-specific knowledge, generic and subject-oriented skills as well (James, 2002). Yet, such investment in curriculum development may require a reiteration since "[a] transition from one generation of competency-based approaches to the next is the increased focus on outcomes, versus process" (Ford, 2014, p. 1). As it was foreseen, the new millennium brought about a new era to the competency-based education with the rise of information and communication technologies and a need to revise competencies valued in the 20th century. Hereupon, as Ford (2014) put forward, the focus has dominantly been on shapeshifting

competencies instead of the process required for such a revision on curriculum both in the global and national levels.

2.3 Education in the 21st Century

Alongside the rise in utilization of competency-based education, discussions among two different approaches on higher education curriculum policy escalated even further (Bridges, 2000). These discussions, in fact, endured more than a century and the parties were, as Moore and Young (2001) designate, neo-conservative traditionalism and technical-instrumentalism. However, both parties had their own concerns about the role of curriculum in the new century.

To begin with, their views on curriculum are dissimilar. While the former party embraces an understanding of curriculum as "a given body of knowledge" in which learners must submit themselves to "[become] the person it is supposed to make you" (Moore & Young, 2001, p. 447), the latter employs a perspective of which curriculum is a means to prepare citizens aligning with the needs of economy, more specifically knowledge-based economy in the 21st century (Moore & Young, 2001). Moreover, while neo-conservatives do not approach to discussions from a perspective on what should be included in the 21st-century educational programs, they indeed insist on the continuity of academically loaded 'legacy' curriculum (Scott, 2006). On the other hand, instrumentalists underline a functionalist view as demands of societies and the issue of learners' employability in the new century should not remain unanswered by curriculum developers (Scott, 2006). However, the latter approach has dominantly employed within higher education policy thanks to the works of international governmental collaborations such as Bologna declaration (Karseth, 2008).

Besides the transformations in education institution of the altering society in the new century, other institutions such as technology and economy have also experienced significant innovations. Thanks to unpredictable rapid enhancements and changes in information and communication technology (thereafter ICT), and their anticipated impacts on societal and educational systems, the economies of countries and the terms

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defining skills in the 21st century for employability, citizenship and self-actualization have become entirely different than the previous century (Bellanca, 2010; Dede, 2010). Moreover, these influences in societal systems have redefined the present society as a knowledge society, "in which ideas and knowledge function as commodities" (Anderson, 2008, p. 6). Thus, such a transformation in society has led to some alterations to economies through the business sector accordingly.

The global alterations from the business side, as Dunning (2000) discusses, have attracted attention on some particular competencies such as mobility, communication and collaboration in educational programs. Similarly, Levy and Murnane (2004) put forward that business sector in the 21st century has started looking for citizens who can more effectively exchange information and also understand particular information. More explicitly, expert thinking and complex communication have become the favourable attributes of the human workforce in the century (Chu et al., 2017; Levy & Murnane, 2004). Due to all these developments and changes by ICT and their influences in social institutions, and the consisted overall ambiguity on particularly required or lately demanded skills, a need has risen to identify and clarify what knowledge society asks for and require from individuals to become active participants in a more assembled structure (Ananiadou and Claro, 2009; Gordon et al., 2009; Voogt & Roblin, 2012).

2.4 21st Century Competencies

As a response to the need for a change in human capital, the competences knowledge society longs for have been accumulated under a roof-term '21st-century competencies' in general (Gordon et al., 2009). Despite overall agreement on the determined roof-term, the literature accentuates three apparent discussions on the nature of the competencies in terms of an ambiguity on the designated term; skill or competence (Ananiadou and Claro, 2009; Chu et al., 2017; Voogt & Roblin, 2012), characterization of the 21st century competencies (Gordon et al., 2009; OECD 2005; Westera, 2001), and origins of them (Dede, 2009; Voogt & Roblin, 2012).

2.4.1 Ambiguousness

First, incoherence on which term to use to designate the competencies demanded by the present society among scholars and organizations is noticeable. Mainly, while Ananiadou and Claro (2009) underline nonexistence of a consensus on a precise term for a knowledge and skill set, Chu and colleagues (2017) conclude that the utilization of the seemingly distinctive but contextually interchangeable terms has endured through time in the literature. For instance, while OECD (2004) promotes those skills as lifelong learning competencies, the European Union framework (European Parliament, 2007) refers to them as key competencies. On the other hand, Partnership for 21st Century Learning (thereafter P21) (P21, 2002; P21 2015) and International Society for Technology in Education (ISTE, 2007) name them as either 21st-century skills or 21st-century learning. Although all organizations and scholars point towards the competencies demanded by the knowledge society, the main focus in their studies and frameworks is conveyed by the roof-term they have picked.

2.4.2 Characterization

Unlike in the first discussion, there is an agreement on the acknowledged characterization of 21st-century competencies. The structure for characteristics of these competencies are outlined as being transversal (Gordon et al., 2009; OECD, 2005), multidimensional (OECD 2005; Westera, 2001), and related to higher-order competencies (Westera, 2001) which covers "abilities to cope with complex problems and unpredictable situations" (Voogt & Roblin, 2012, p.300). Transversal competences, or "cross-curricular competencies" (Gordon et al., 2009, p.11) are defined as competencies that are not necessarily bound to a specific area. A transversal competency has an attribute of being applicable across many fields. The multidimensionality side of competences brings wholeness as it implies an inclusion not only of knowledge and skills but also of attitudes (OECD, 2005; Westera, 2001). Last but not least, 21st-century competencies are generally associated with higher-order thinking abilities since coping with possible problems encountered in the era compels individuals to utilize more than one competence at the same time in the

process of reacting to situations (Collins, 2014; P21, 2015; Westera, 2001). In overall, having comprehensive knowledge of these characteristics enhances understanding both the nature of and the literature about the 21st-century competencies.

2.4.3 Origin

Another discussion in the literature has risen generally among scholars and educational policymakers due to a crucial topic: alignment of, as Dede (2009) calls, legacy curriculum or 20th-century curriculum to what the present society asks for and requires. The alterations in societal and economic systems have introduced either some adjustments to already existing skills or aided the birth of new skills (Voogt & Roblin, 2012). Dede (2009) entitles the former as a change in the nature of perennial skills and the latter just as contextual skills. The former, or a variation on perennial skills, is simplified as "not new, or just newly important" (Silva, 2009, p.631). In that sense, the main variation has been on the importance level of already existing skills. For example, although some perennial skills such as critical thinking, problem-solving, and communication have already been a part of the global legacy schooling curriculum (Chu et al., 2017), these transversal skills in the 21st century have been increasingly highlighted in curriculum policies (Levy & Murnane, 2004; Rotherham & Willingham, 2009).

While the knowledge society now longs for and benefits some skills more than ever, some of its time-and-place specific requests have gone unanswered until contextual skills arise (Dede, 2010). As valuable examples for this type of skills, Dede (2009) proposes that technological advancements lately request a skill of "disorderly knowledge co-creation and sharing" (p. 2) among many other contextual skills in addition to "continual updating and [even] being a lifelong learner" (Chu et al., 2017, p.18). As well as the importance of understanding notions themselves, it is valuable to notice the origin of skills since it is helpful in constructing a more grounded perspective for not only stakeholders in policy making in process of innovative curriculum revisions but also researchers in the field to build a common consensus avoiding possible ambiguousness.

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2.5 Educational Challenges

While gaining gradual world-wide popularity and inducing alterations in what international and national business sector expects from prospective employees to acquire, the 21st-century skills movement has posed challenges to educational systems as well (Dede 2011, Voogt & Odenthal, 1997; Voogt & Roblin, 2012). Mainly, an urgent need for reforms in educational systems has arisen and comprehension of the unpredictability of the 21st century has spread into the field. Fortunately, while the movement has brought about massive collaborations at international level, this cooperation has resulted in standardization in national stages.

As a natural reaction, supporters and advocates of the movement have been marking a need for reforms in schooling and education (Ananiadou & Claro, 2009; Chu et al., 2017) due to a functionalist consideration that education has been pursuing such a main goal of producing capable citizens who carry potentials to actively contribute to and participate in the economy, society and persona they live within (Chu et al., 2017). During the transition years to the current millennium, these demanded reforms have been conceptualized as a change of mere focus in educational policy from a perspective of pure traditional subject knowledge transition via curriculum (supported by neo-conservative traditionalists) onto a combination of the traditional approach with vocational education incorporating 'key skills' and their application into subject knowledge (demanded and proposed by neo-technical instrumentalists) (Moore & Young, 2001). In other words, a need for a transition from subject-based to competency-based curriculum has been underlined in the field. Unfortunately, it's been expected from education to respond quickly to such kind of reforms and adapt them accordingly by addressing, issuing, and also localizing the demand in national educational policies as soon as possible. Although the demand was crystal clear, another challenging consideration has been keeping responses on hold.

Despite all these grounded discussions and valid national and international requests, the new form of society, or knowledge society, has characterized a feature of constant change by its nature. Thus, it has spread uncertainty to the field of education in both

national and international dimensions. In other words, the situation is explicitly stressed by Andreas Schleicher (2010), OECD Education Directorate;

> A generation ago, teachers could expect that what they taught would last their students a lifetime. Today, because of rapid economic and social change, schools have to prepare students for jobs that have not yet been created, technologies that have not yet been invented and problems that we don't yet know will arise (para. 7).

Consequently, the urgency of the need from nations and unpredictability in the field have required an intense collaboration including not only non-profit global organizations, educators, and governments but also leading international business companies to respond with a grounded framework of skills helpful to cope with whatever 21st century brings (Voogt & Roblin, 2012). Hence, creating a consensus in the international level has been considered as a crucial contribution that can guide curriculum innovations nation-wide and globally.

2.5.1 Bologna Process: An International Response

In the city of Bologna, Italy in 1999, representatives of higher education from 29 countries have gathered up to discuss and sign a declaration to standardize "the implementation of the three-cycle degree structure, recognition of qualifications and quality assurance" within the participative countries (European Commission, 2018, p. 13). In fact, the declaration was attractive at the international level. In addition to Turkey's involvement in 2001, more countries have taken part in and the number of signed countries has increased to 48 in total up until today (European Commission, 2018). In the long run, this cooperation among singed countries, or also called as the internationalization of higher education aims to achieve increasing international competitiveness, the mobility of educators and learners, and employability of degree holders (Onursal-Beşgül, 2014). To achieve such aims, a standardization process on the national level in higher education policy among participants has become an initiative.

According to Onursal-Beşgül (2014), international cooperation has highlighted an important aspect of education in the 21st century: student-centred education. Especially for concerns on the recognition of qualifications and quality assurance, the committee first developed a European Qualifications Framework (EQF) in 2008 and then asked participatory countries to develop their own national qualifications frameworks aligning with EQF. The EQF in its basic form aimed to provide guidelines for its three main stakeholders: individuals (workers and learners), employers, and education and training providers (European Commission, 2008). To be more specific, this framework provided expected student qualifications (encompassing minimum knowledge, skills and attitudes) for each degree level in higher education (Onursal-Beşgül, 2014).

2.5.2 Turkish Qualifications Framework: A National Response

Turkey as an active participant of the Bologna Process had to develop its own national qualification framework. This process has carried out by the Council of Higher Education (CoHE) and the adaptation process was finalized in 2011 (Erdoğan, 2015). The developed national framework called Turkish Qualification Framework (TQF) is to be utilized by each university as a guideline in their higher education curriculum development process including conceptualization of learning outcomes, course development process, and estimation of course credits by taking student workload into account (CoHE, 2007). But most importantly, the framework indicates minimum competencies a graduate of a specific higher education program possesses (Erdoğan, 2015; Onursal-Beşgül, 2014), which also covers the teaching profession.

According to the Turkish Ministry of National Education (MoNE), the innovations and developments in Turkish educational system due to the Bologna process have inevitably exposed a need for revision in the teaching profession as well (MoNE, 2017). For development process of "general competencies for teaching profession", the ministry specifically states in its report that a variety of stakeholders involving governmental agencies, academics and teachers have investigated the international organizations' reports (UNICEF, UNESCO, OECD, the World Bank, and European Council) on current educational trends around the world and their competency

frameworks. Moreover, while the report explicitly underlined the aim of Turkish national education in the 21st century as "Turkey aims to raise generations equipped with the 21st-century skills" (MoNE, 2017), the teaching competencies were developed around the overarching skills such as creativity, innovation, critical thinking, problem solving, collaboration and communication.

To sum up, international governmental cooperation such as the Bologna process resulted in the emergence of an overarching framework and national equivalents to create a consensus at least to some extent. Meanwhile, some world-wide non-profit organizations and profit-oriented companies from business sector were also gathered up in an international collaboration with an aim to develop frameworks designating, defining and conceptualizing the 21st-century skills that can guide curriculum innovations nation-wide and globally. Therefore, the very first step was taken by a prominent organization.

2.6 The Framework Zero

Before the development of many alternatives from several organizations, the United Nations Educational, Scientific and Cultural Organization (thereafter UNESCO) has become the very first organization which attempted to provide a solution expected globally. In their UNESCO report, Delors and colleagues (1998) interpret the transition from 20th to the 21st century as concurrent alterations in each institution of society but especially highlight a change in focus "from short-term to long-term aims of human development" (p. 1). Embracing continuing education, UNESCO in 1996 has developed and published the very first framework for the century (Chu et al., 2017). In the framework, four key transversal components of education have been identified (Delors et al., 1996) as follow:

1. Learning to know: focusing on foundations for learning throughout life
2. Learning to do: learning how to deal with a variety of situations
3. Learning to live together: developing an understanding of others' background; their history, traditions, cultural and spiritual values

4. Learning to be: developing greater independence, judgement and a sense of responsibility

Depending on their analysis on trends of the time on and relations between education, society and economy, Delors and colleagues (1996) have provided, with this framework, at least a general guideline that educational policy-making groups should follow to modify legacy curriculum with what knowledge society longs for. Furthermore, UNESCO in 2015, two decades later from the first publication, has examined the way these transversal components, or competences, are perceived in educational settings. Although UNESCO framework has provided a baseline and an overview, more detailed and described alternatives have emerged later in the century as a solution to provide more illuminated ways.

2.7 Alternative Frameworks

Fortunately, various groups around the world have gathered up mainly on one general purpose: "[promoting] the integration of 21st-century competencies in national curriculum policy" (Voogt & Roblin, 2012, p. 301) by providing outcome standards for required curricular renovations (Chu et al., 2017). All alternatives have been developed since each collaboration has either desired to approach the skills within a specific focus or intended to supply updates to perennial components. In that sense, the literature indicates that eight famous frameworks (excluding the framework zero) have hitherto been generated through three different main focuses: ICT, teaching and assessment specific, and generic (Chu et al., 2017; Dede, 2009; Voogt & Roblin, 2012).

As Table 2.1 shows, while three famous frameworks with the main focus on ICT competencies have gained international attention, two well-known teaching-and-assessment-based frameworks and three prominent generic frameworks have emerged so far. Regardless of aiming for lending assistance, variety in frameworks has induced disparities into the field.

Table 2.1

Main Focuses and Frameworks

Main Focus	Frameworks
ICT Based	EnGauge
	National Educational Technology Standards – ISTE
	ICT Competency Framework for Teachers – UNESCO
Teaching and Assessment Based	Assessment and Teaching of 21st Century Skills
	National Assessment and Educational Progress
Generic	New Millennium Learners – OECD
	Key Competencies for Lifelong Learning – EU
	Partnership for 21st Century Learning – P21

Note: Adapted from "A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies", by Voogt & Roblin (2012).

2.7.1 The Disparity

Examination of the variance in frameworks has spread three major disparity to the field of education. The first disparity is some frameworks lack valid and grounded suggestions on how to employ those skills in practice. From investigations of various educational policies on 21st-century skills and different frameworks, Chu and colleagues (2017) have concluded that some of those frameworks lack providing means, especially in the assessment of transversal skills, for practitioners in education, which causes another need to rise. The second disparity is framework development processes lack of cross-cultural and across discipline educational research on transversal skills, which encourages localization and hinders validity of those competencies (Chu et al., 2017). The last but not least difference is that not all frameworks administer perspectives of individuals from the learning environments who in fact feel the change and need in the first hand (Voogt & Roblin, 2012). Such kind of deficiency in framework development may be a reason for the first concern as

a result of less consultation with school communities. Nevertheless, apart from those disparities, there are some midpoints in which those frameworks meet.

2.7.2 The Resemblance

Although having multiple alternatives for 21st-century competence frameworks meaningfully points towards a possible differentiation in core competencies, it does not contextually differ indeed. That is, all alternative frameworks have been established taking transversal perennial skills as pillars in their bases, but each framework has accumulated them under different skill sets with some additional contextual skills to support logic and focus, which, in fact, results in calling the whole framework different from other available alternatives. Thereof, despite minor disparities, alternatives still reflect resemblances on core transversal skills and how to categorize them.

So, what exactly are these core competencies all frameworks have taken advantage of? As a grounded response, Voogt and Roblin (2012) have examined eight frameworks and found that while all frameworks have included collaboration and communication skills in their structure, most of them have accommodated creativity and innovation, and critical thinking and problem solving as core skills. Emphasizing their cross-curricular features and importance, the frameworks indeed provide solid proof that there is a strong global interest and need for those skills in the era. Moreover, P21 (2015) stresses the importance of mastery in those skills, or as it calls "Learning and Innovation Skills", as they are the essential competencies to "separate students who are prepared for increasingly complex life and work environments in the 21st century, and those who are not" (p. 37).

When examined, the generic frameworks mainly reflect resemblances in the placement of the core skills, or some scholars (Dede, 2009; Voogt & Roblin, 2012) call "overarching competencies". In that respect, there are three prominent frameworks labelled as generic by Voogt and Roblin (2012), which are 21st century skills and competencies for new millennium learners in OECD countries (Ananiadou & Claro,

2009), key competencies for lifelong learners (EU Commission, 2007), and framework for 21st century learning (P21, 2015). Despite the inclusion of the overarching competencies in all generic frameworks, the skill set including creativity and innovation, critical thinking and problem solving, collaboration, and communication, however, have been placed under both information and communication categories in the OECD framework. Yet, the remaining two frameworks highlighting familiarities have either built each category over these transversal perennial skills (Ananiadou & Claro, 2009) or designated the skill set as the keystone, named learning and innovation skills, of an arch-type framework to signal their importance (P21, 2015).

Table 2.2

Overarching Competences and Generic Frameworks

Overarching Competences	P21	OECD	EU
Creativity and Innovation	Learning and Innovation Skills	Information & Communication	Embedded in all categories
Critical Thinking and Problem Solving			
Collaboration			
Communication			

All in all, beside aiming to aid those who are responsible for adapting their society's educational system according to the global trends or whatever becoming a knowledge society requires, the latest two generic frameworks (OECD and P21) specifically highlight that the skill set including creativity and innovation, critical thinking and problem solving, collaboration and communication is a core that needs to be transferred to the next generation. Yet, Partnership for 21st Century Learning has become the only organization in the world conducting and publishing more research than any other collaborations (Voogt & Roblin, 2012), continuously providing updates to its publications and framework so far since its establishment in 2002. Moreover, the partnership has promoted the skills mostly addressed by other alternatives under a specific category called: learning and innovation skills.

2.8 Learning and Innovation Skills

The most acknowledged, cited and famous framework in the world has been developed by Partnership for 21st-century learning (P21), a US-national organization founded in 2002. The partnership holds the most diverse stakeholders including consultants, educators both from academia and K12, and business leaders (Chu et al., 2017) from global companies such as AOL Time Warner Foundation, Apple, Cable in the Classroom, Cisco Systems, Dell, Microsoft, National Education Association, and SAP (Partnership for 21st Learning [P21], n.d.). Accordingly, the partnership, embracing an inherited perspective on the 21st century learning with an emphasize on creating life-long learners, has notched up its fame among other collaborations and organizations investigating 21st-century skills due to its compelling efforts, continuous works, and explicit publications on its ever-growing framework.

In the prominent framework, 21st-century skill sets are proposed over revised and adapted key subjects including 3Rs (arithmetic, reading, and writing) and both fundamental and interdisciplinary themes pivotal in the 21st century. While fundamental subjects involve topics such as world languages, arts, economics, government and civics, interdisciplinary subjects contain global awareness, literacy on finance, economy, business, entrepreneurship, and civic, health and environmental literacy.

Moreover, the prominent framework providing an arch-type structure accumulates 21st-century skills under three concise sets of skills. Regarding its generic approach to framework development, the partnership not only stresses its vision and emphasis on creating life-long learners within the skill-set of life and career skills but also pinpoints ICT related competencies in the skill-set of information, media and technology skills. Furthermore, considering the wisely chosen arch-type shape in the frameworks' visualization, the partnership depicts the importance of these skill sets. On that note, while the previously mentioned skill sets are represented as the springers of the arch, the skill-set named learning and innovation skills, or globally known as 4C's, is placed

in the structure as the keystone. Depicting its significance as holding all the structure together, the keystone covers the following overarching skills:

1. Creativity and innovation,
2. Critical thinking and problem solving,
3. Collaboration,
4. Communication.
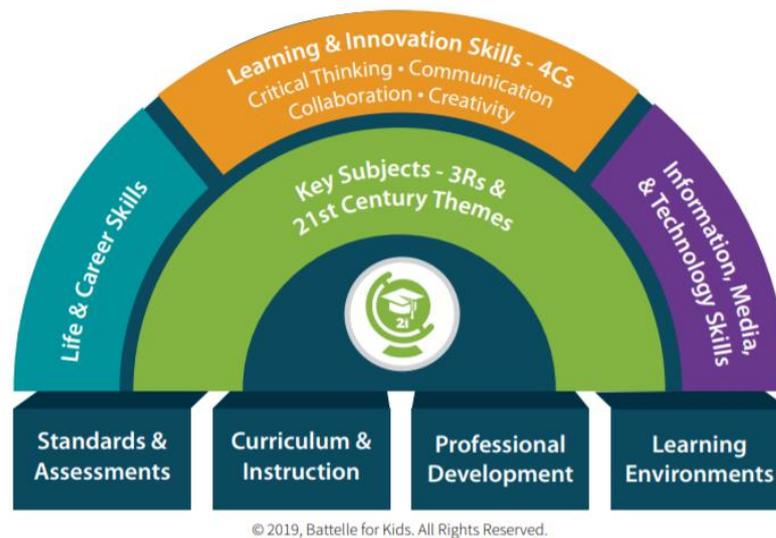
Figure 2.1 The Framework. From Framework for 21st Century Learning by Partnership for 21st Century Learning: A Network of Battelle for Kids. Retrieved from http://www.battelleforkids.org/networks/p21/frameworks-resources. Copyright 2019 by Battelle for Kids.

2.8.1 Creativity and Innovation

Being highlighted as prominent educational outcomes by educators and business leaders in both previous and current century, creativity and innovation are among the essentially demanded skills in the 21st century. Although they seem to have their own particular definitions, they are contextually and mutually complementary. In that sense, while creativity is mainly perceived as "an ability to produce novel and useful ideas [which] not only are original and make a unique contribution to the field, but also serve some purpose or fulfill some need" (Lai et al., 2018), innovation,

meanwhile, is considered as successful utilization or application of a creative solution or product (Amabile & Pillemer, 2012). Yet, as much as its definition indicates divergence, so are its models comprising the skills' indicators.

Joy Paul Guilford, an American psychologist, has contributed to creativity research with his remarkable studies of human intelligence in terms of divergent models of thought processing. Proposing divergent production is a vital essence of creativity, Guilford has also advanced his research and published the famous document enlisting fifteen "characteristics of the creative adult" and twenty suggestions on teaching creativity through educational programs (Guilford, 1973). Following the path of the pioneer, early scholars have begun examining attributes of successful people with publicly recognized achievements in creativity (Sternberg, 2006), which moved the field essentially thenceforward (Lai et al., 2018). Moreover, Al-Oweidi (2013) proved the continued relevancy of Guilford's characteristics of creative potential among contemporary research in the field with her study on creative characteristics in learning environments. In brief, besides triggering the research, Guilford's contributions have still benefitted the field of education.

It is certain that creativity and innovation have endured through time and inherited into the 21st-century curriculum (Griffin, McGaw, & Care, 2012; Lai et al., 2018; Trilling & Fadel, 2009). However, two concerns have risen about these skills' transmission through schooling. First, attributes of creative and innovative personas, unfortunately, do not match with what traditional curriculum has generally brought to schooling. Creativity and innovation necessitate some level of autonomy from individuals. On the other hand, the traditional curriculum in some cases only expects individuals to act in a predefined way, which blocks the possibility of creative and accordingly innovative thinking (Craft, 2003). Perhaps, it is the reason why these skills are not actually conveyed by teachers during classes (Westby & Dawson, 1995). In this context, Beghetto (2007) revealed that transferring creativity and innovation skills requires a level of teaching experience and self-confidence on classroom management, and novice teachers, therefore, tend to avoid implementing activities supporting creativity

and innovation and prefer instructional tasks with definite steps or known answers. Deductively, successful development of the skills in schooling level demands actions and improvements in the very beginning; teacher education.

2.8.2 Critical Thinking and Problem Solving

Condensing into a comprehensive term over years, critical thinking is an overall ability encompassing logical thinking, argumentation, decision making and problem-solving (Butler et al., 2012; Halpern, 2003; Ventura, Lai, & DiCerbo, 2017). Vastly causing the rise of discussions among scholars in the literature and therefore resulting in the formation of various approach, its definition still revolves around being a versatile skill which substantially employs problem-solving ability whenever vague information is solely available (Ventura, Lai, & DiCerbo, 2017). However, the definition of the skill is not the only disagreement among scholars.

Whether critical thinking in learning settings necessitates a level of background knowledge has been an essence of discussion for a while. Some researchers advocate the entailment of background knowledge during utilization of the skill especially in learning environments for assessment purposes (Case, 2005; Willingham, 2007). In other words, the ill-defined information, depending on the definition beforementioned, in a learning environment should always be related to topics of which learners are familiar with to enable them to think critically. On the other hand, others highlight that the skill is so transversal, or cross-curricular, that it can be demonstrated in any context and be transferred through educational programs without relying on specific content. Consistently, Solon (2007) explicitly clarifies what generic critical thinking skill refers to as "being able to correctly assess whether an inference, regardless of content, is acceptable or not, and being able to explain why the reasoning is good or faulty" (p. 96). As a consequence of these arguments, the literature brings both domain-specific and generic models with regards to comprehension of the nature of critical thinking.

The significance of mastering in critical thinking is now overflowing the boundaries of learning environments towards every aspect of life (National Education

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Association, 2014). Yet, the learning environments are the best places where individuals may start excelling at the skill before starting to survive in the jungle of the business sector. Hence, the faculties of education carry a vital responsibility to equip prospective teachers with critical thinking to enable an opportune and successful transmission of the skill to the next generations (Williams, 2005). Thereof, ensuring teacher education programs transfer critical thinking skills to preservice teachers not just to enable them as an agency in delivering the skill but also to strengthen their attitude on improving their own critical thinking skill throughout life is a crucial assessment that teacher education researchers should pay attention on (Varga, 2011).

2.8.3 Collaboration

Associated with scholastic achievement (Druskat & Kayes, 2000; Lai, DiCerbo & Foltz, 2017), with learning and working as and in a group (therefore with adaptability and coordination) (Druskat & Kayes, 2000; McClough & Rogelberg, 2003; Prichard, Stratford & Bizo, 2006), and even with civic competence and democracy in terms of a mode of living together (Althof & Berkowitz, 2006), collaboration, another skill in 4Cs, is mainly identified as an ability to interact with individuals in order to work together toward a common goal (Lai, DiCerbo & Foltz, 2017). Due to its undeniable relation with and within education, collaboration as a skill has remained one of the fundamental educational attainments and taken its place in all noted 21st-century skill frameworks (Voogt & Roblin, 2012). However, the literature specifically holds comprehension of collaboration as a skill itself separate (Kuhn, 2005).

The notion of collaboration has been perceived from two distinctive perspectives. Lai, DiCerbo and Foltz (2017) touch upon the subject by stating the distinction as it is approached both "as a means to an end" and "as an end itself" (p. 8). The former approach typifies an understanding of collaborative learning in which collaboration is utilized as a way of teaching and learning about any content without necessarily focusing on collaboration itself. The approach has been surpassing the latter for a very long time in the literature. On the other hand, the latter distinguishes collaboration as a skill itself which is of great value and deserves as much focus on its development as

others. This view is pointed out as kind of a new aspect raised with the 21st-century movement (Griffin, Care & McGaw, 2012; Trilling & Fadel, 2009). Due to the fact that the former approach in learning environments does not necessarily facilitate mastering at collaboration itself (Le, Janssen & Wubbels, 2018), collaboration as a skill requires a deliberate attention in curricula since a failure at proficiency in the skill during school years results in individuals with a disadvantage within and outside of workspace (Kuhn, 2015).

To enable opportune skill transfer to next generation entails ensuring successful attainment of skills by teachers of tomorrow during teacher education programs. It is crucial to equip them with one of the transversal perennial skills, collaboration, not just for their utilization during their professional career either as a teacher in a school environment where collaboration is always utilized, for example, to connect families, school staff and students together (Gentry, 2012) or as any other title they can work under since the business sector in the 21st century requires individuals who can work in a team more than ever (Lai, DiCerbo & Foltz, 2017). Yet, teacher education programs lack both required and expected focus directly oriented at the collaboration skill itself (Weiss, Pellegrino & Brigham, 2017). For this reason, it is essential to teach preservice teachers about collaboration as a skill in addition to the notion of collaborative learning or teaching.

2.8.4 Communication

Communication as a skill has been an exceptionally pivotal educational outcome in each formal educational program all over the globe. Embodying various forms such as verbal or nonverbal, and linguistic or nonlinguistic, communication as a skill is mainly characterized as an ability to engage in "a social process in which information is exchanged in order to establish shared meaning and to achieve desired outcomes" (Metusalem, Belenky & DiCerbo, 2017, p. 5). Due to its existence as a prevailing skill like collaboration, communication has always found itself a place in all frameworks developed through 21st-century movement (Voogt & Roblin, 2012). The explicit

reason to why it has remained valued as fundamental attainment relies on its three main benefits.

Aiming for and providing opportunities to development of communication skills of individuals through educational programs provides vital inputs to the function of their immediate and future success in personal and professional lives (Bates, 2006; Cline, 2005; Morreale & Pearson, 2008; Tucker & McCarthy, 2001). First, proficiency in communication skill helps individuals have lucrative and vigorous intrapersonal and interpersonal relationships (Barker, 2006; Downing, 2005; Levine, 2005; McCracken, 2006). Morreale and Pearson (2008) underline that a special focus on the development of the skill in learning environments provides learners with opportunities to experience various forms of communication happening in real-life. Second, mastery in the skill helps the characterization of individuals by making them more social citizens to societies (Berry, 2005; Du-Babcock, 2006; Scudder, 2004). In that sense, due to an entailment caused by alterations occurring in societies such as becoming more culturally diverse in the 21st century (Du-Babcock, 2006), educational programs fostering the communication skill itself in individual development raise more socially adaptable citizens, which contributes societies to become healthier accordingly (Morreale & Pearson, 2008). The last but not least, having individuals with improved communication skill in a learning environment enhances the quality of shared information and, in return, the quality of learning (Martin & Myers, 2006; Myers, Martin & Knapp, 2005). In that sense, instructional approaches such as a cross-curricular focus on the skill and extracurricular activities supporting communication promote experiences learners might have (Dannels, 2001; Helsel & Hogg, 2006). Even though the ways and benefits of improving communication skill are crystal clear, the discussion in the literature tends towards the backbone of education: teacher preparation.

Communication has been the ultimate attribute of the teaching profession. Therefore, it is of no significance to say teacher education program does not convey the communication skill at all (Hunt, Wright & Simonds, 2014). However, for both

individuals and societies to take advantage of the skill's benefits beforementioned, teachers should possess the communication skill at a good level. Thereof, scholars continuously utter the need to assess teacher education programs in terms of transferring the ultimate attribute of the profession to prospective teachers (Coggshall, 2007; Khan, Khan, Zia-Ul-Islam & Khan, 2017).

2.9 Teacher Education and Teaching Competencies in Turkey

With approximately one million teachers currently in schools in Turkey, teacher education can be considered as a backbone of Turkish national education. Considering that, Ministry of National Education in Turkey has already realized that achieving the national aim to raise 21st century citizens for Turkish society depends on raising qualified teachers (MoNE, 2017). Since teacher education programs in Turkey are giving service within the higher education structure since 1982 and higher education programs are supervised under Council of Higher Education, MoNe and CoHE have collaboratively taken actions to improve quality of the teaching profession through innovations in teacher preparation programs. For that reason, their ultimate focus has been on the competencies of the profession.

To begin with, the initial studies on determining competencies for the profession dates to 1999, which is even before Turkey's inclusion into the Bologna Process. Under the project National Education Development in Turkey (MoNE, 2017) started with the cooperation between CoHE in Turkey and the World Bank, teacher competencies for Turkey were formed through intensive studies including needs analysis and examination of teaching competencies developed in other nations and finalized in 2002. Then, these competencies were shared with faculties of education to adapt their teacher education programs accordingly.

The teacher-training related activities of another project called Basic Education Support Program were initiated in 2002. To redefine teacher competencies with a consideration of becoming consistent in the European stage, General Directorate of Teacher Preparation and Education under Turkish Ministry of National Education

conducted workshops with the financial support by European Union Commission. To achieve it, teacher competencies from some countries such as United States of America, England, Australia and Ireland have been examined and they have been embedded into the new framework called "general competencies for teaching profession" in Turkey. The document unveiling the competencies and their explicit indicators was published in 2006. Moreover, the competencies incorporated learning and innovation skills under the domain of personal development of teachers (MoNE, 2006).

After the publication of European Qualification Framework in 2008, Turkey had to revise its existing framework infrastructure to align it with the EQF as a signatory in an agreement of standardization of higher education, or in other words the Bologna Process (MoNE, 2017). Therefore, Turkish Qualification Framework has been developed and published in 2015. Consequently, a revision for teaching competencies also emerged. Then, General Directorate of Teacher Preparation and Education once again gathered up many stakeholders including other governmental departments related to Turkish education, academics and in-service teachers as well. By employing various perspectives of participants and drawing advantage of similar policies from 8 countries also including Hong-Kong, Singapore and Canada and non-profit international organizations such as UNESCO and UNICEF, the directorate has updated the competencies for teaching profession in Turkey in 2017 (MoNE, 2017). In this instance, the learning and innovation skills have been utilized as building blocks of the newly revised framework. To emphasize this, MoNE (2017) explicitly states that "These qualifications, which are expected from a teacher to perform his/her profession properly, form the basis of teacher competencies." (p. 7). With the statement, the importance and merit of the skill set for teacher preparation have become once more apparent in the national stage.

In brief, it is undeniable that authorities in Turkey has the initiative to improve teacher and in return teaching quality. Although several considerations have been made on the competencies requested from 21st century teachers in Turkey, the consensus on the

essentials of the proposed competencies have not changed. Ultimately, while teacher education is the backbone of Turkish national education system, learning and innovation skills constitute the pillars of teaching competencies in Turkey.

2.10 Research on 21st Century Learning and Innovation Skills

Teacher education in the 21st century is not a new topic being searched neither globally nor nationally. Due to an incontestable variance in knowledge and skill levels of graduates of teacher preparation programs for the profession and its requirements and demands in the time (Darling-Hammond, 2006; Darling-Hammond, Chung, & Frelow, 2002; Darling-Hammond, 1997), there is a preponderant concern in the field of teacher education on both the evolution and evaluation of teacher preparation programs with regards to their alignment to 21st-century subjects, themes and skills. For that reason, while the abundance of global research has carried out to assess whether in-service teachers are already adequately equipped with 21st-century skills, there happened a few studies examining the issue in the preservice level (Urbani, Roshandel, Michaels & Truesdell, 2017). Fortunately, the global concern does not appear in Turkish literature. In the following paragraphs, the studies on teacher education regarding the fundamental and essential skill set; learning and innovation skills, are discussed. The discussion for each skill includes both its conceptualization from preservice teachers' perspectives (Ammentorp & Madden, 2018; Bal-İncebacak, Sarışan-Tungaç, & Yaman, 2018; Çakmak, Budak & Kayabaşı, 2018; Davis, Hartshorne & Ring, 2010; Erdamar & Demirel, 2010; Gentry, 2012; Kanik, 2010; Kaufman, 2006; Schreglmann & Kazancı, 2016; Son & Lee, 2016; Tok, 2015) and statistical examinations of its level in terms of gender and department (Akça & Şakar, 2017; Baykara-Pehlivan, 2005; Çetinkaya, 2011; Demiral, 2018; Elkatmış & Ünal, 2014; Erdem & Yazıcıoğlu, 2015; Gülveren, 2007; Kutluca, 2018; Milli & Yağcı, 2017; Ocak & Erşen, 2015; Örün, Orhan, Dönmez & Kurt, 2015; Tan & Tan, 2016; Temizkalp, 2010; Topoğlu, 2015; Yiğitcan Nayir & Tekmen, 2017).

2.10.1 Creativity and Innovation

Although creativity and innovation are the competencies that are in fact contextually and mutually complementary, the studies generally investigated them separately. Moreover, while some studies looked at their conceptualizations from preservice teachers' perspectives, others quantitatively examined to what extent preservice teachers developed these skills throughout their teacher preparation programs. Furthermore, these quantitative investigations also looked for a significant difference between levels and some individual variables such as gender and department to provide the literature with more explicit results. In that sense, the studies related to creativity and innovation are expressed in the following paragraphs with regards to their conceptualizations and the skill levels preservice teachers have.

First, Schreglmann and Kazancı (2016) carried out research with an aim to reveal preservice teachers' conceptualization of a "creative teacher". For the study, the researchers developed and administered an opinionnaire. The research was conducted in a university in Turkey with 227 participants from 6 teacher education programs including the Departments of Computer Education and Instructional Technology, Early Childhood Education, and Elementary Science Education. And, 614 metaphorical answers collected from the participants accumulated under 8 major themes. Among which, some themes were a problem solver, leader, essential, innovative, and productive. The researchers concluded that the preservice teachers positively conceptualized the term "creative teacher" and suggested that teacher education programs in Turkey need to include the notion "creative teacher" into their curricula either as an entire course or a topic to further reinforce preservice teachers' perceptions and experiences on creativity.

In another similar study on creativity, Tok (2015) investigated conceptions of preservice teachers only from the Department of Early Childhood Education. The research included 130 sophomore preservice teachers in a university in Turkey and the researcher implemented an opinionnaire to collect their metaphorical answers on creativity. The collected metaphors were accumulated under two major themes, which

were the characteristics of creative thinking and attributes of a creative persona. The result of the study indicated that the participants mostly reported on the characteristics of creative thinking. Moreover, after a frequency analysis on results, the researcher concluded that preservice teachers dominantly agreed on some well-known characteristics of the thinking model such as novelty and divergence. Based on the findings, Tok (2015) calls teacher preparation programs for an action to provide their preservice teachers with more in-class opportunity to learn about the creative process, implementation of the skill, characteristics of the thinking model, and attributes of being a creative person.

Fortunately, Dere (2017) investigated the effect of a compulsory course called creativity and development given as a part of the Early Childhood Education curriculum in Turkey on prospective teachers' creativity levels. The researcher administered both a form for demographic information and Torrance's creativity test to 51 sophomore preservice teachers studying in a university as a pre-test and post-test. The course was given in one academic semester by the researcher, which took 12 weeks and covered the crucial topics such as "the creative process, creativity theories, creative thinking techniques, aesthetics, activity planning and evaluation on creativity, roles and strategies supporting creativity" (Dere, 2017, p. 1192). When the pre-test and post-test comparison were carried out, the results underlined that the course significantly improves the preservice teachers' creativity scores on Torrance's creativity test. Therefore, the researcher suggests that other teacher education programs also need to embed a similar course into their curricula.

Studies on levels of creativity do not only revolve around the department of Early Childhood Education. In that sense, Temizkalp (2010) conducted a study to explore creativity levels of prospective teachers studying not only in the Department of Early Childhood Education but also in the Departments of Elementary Mathematics Education, Elementary Science Education, Primary School Education and Computer Education and Instructional Technology. In total, 300 preservice teachers participated in the study. After administering both a form for demographic information and

Torrance's creativity test, the researcher concluded that while the highest score belonged to the Department of Early Childhood Education, the lowest score belonged to the Department of Computer Education and Instructional Technology. Moreover, the results revealed that female preservice teachers scored significantly higher than males only in the elaboration (or divergent thinking) subdomain of creativity. Based on the results, the study recommended the inclusion of an elective or even compulsory courses into teacher preparation programs to enable preservice teachers to explore their creative potentials and improve them.

Moreover, Topoğlu (2015) also examined preservice teachers' levels of creativity with respect to some individual variables including gender and department. The researcher administered the Raudsepp's Creativity Scale to 1028 preservice teachers studying in all levels of 6 different teacher education programs at a university in Turkey. Departments included in the study were Music Education, Arts Education, Primary School Education, Early Childhood Education, Social Studies Education and Elementary Science Education. The results of the study highlighted that there were neither a significant interdepartmental difference nor a significant gender difference on creativity levels of the preservice teachers. Still, the study emphasised that while the highest score on creativity belonged to the Department of Elementary Science Education just after the Department of Arts Education, the female prospective teachers scored slightly higher than the males. In conclusion, the researcher stressed that teacher education programs need to facilitate the development of creativity in preservice teachers not only in courses but also with extracurricular activities.

Furthermore, Kaufman (2006) conducted a research study with an aim to assess "creative self-perceptions of 3553 students and community members in 56 different possible domains distributed across five factors" (p. 1065). These factors were science, social, visual arts, verbal art, and sports. In the study, Creative Domain Questionnaire were administered. Moreover, the analysis of data with regards to different individual variables also shed light on female and male perceptions of creativity in different areas of professions. The research revealed that there exists a gender difference in self-

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reported creativity. In that sense, while females scored significantly higher in social and visual arts professions including teaching, males scored higher in science and sports professions such as mechanical and sports performance.

Second, the notion of being an innovative teacher is another issue the studies in the field of teacher education have focused on. In that sense, Davis, Hartshorne and Ring (2010) carried out a qualitative study with an examination of course journals that preservice teachers were asked to prepare throughout a semester. In the study, the aim was to reveal freshman preservice teachers' conceptualization of innovation. In total, 51 freshman preservice teachers participated in the study. Using 5 revealed conceptualizations, the researchers suggested an ordered layered structure to an understanding of innovation. Respectively, they are "resistance to innovation", "awareness of innovation", "exploration of innovation", "identification with innovation" and "integrated view of innovation" (Davis, Hartshorne & Ring, 2010, p. 17). Moreover, in the explicit structure, the associated attitudes with layers were respectively fear of using technology, using technology, being an efficient teacher, being an effective teacher, and lastly lifelong learning and continuous improvement. Regarding these explicit classifications, the study highlighted that while an understanding of technology integration in education is associated with the level called "awareness of innovation", an understanding of self-development without adhering to any specific form of technology is aligned with the level of "integrated view of innovation". In conclusion, since the study included freshman preservice teachers, the suggestions were related to K12 level. Yet, it was concluded that preservice teachers' understanding of innovation should revolve around using technology as a tool to enhance learning, instead of an approach that what being an innovative teacher is to use technology.

In another study on the conceptualization of innovation, Bal-İncebacak, Sarışan-Tungaç and Yaman (2018) examined 121 in-service primary school teachers' perceptions about novelty and innovation in education. In the study, an open-ended questionnaire was administered and therefore qualitative data analysis was carried out.

The results showed that in-service teachers' understanding of innovation diverges a lot. While the answers majorly referred to technology, some other revealed themes were progression, production, necessity, accessibility, leadership, divergence, development and power. Crucially, the results underlined that three out of every four in-service teachers stated that they do not know what the term innovation means. With regards to these results, the researchers suggested that workshops and immediate actions are necessary to configure the conceptualizations in the correct way.

Moreover, Çakmak, Budak and Kayabaşı (2018) examined the attributes of an innovative teacher from the perspectives of graduate students in the field of education. An open-ended questionnaire was administered to 36 graduate students. After a content analysis, the revealed themes were the use of technology, self-development, attitudes such as being open to new experiences and collaborating with others, motivation, and teaching related approaches such as being student-centric and guidance. Since the notion of innovation in this study was associated highly with openness to change, the results indicated that most of the graduate students considered themselves as innovative. Still, the researchers underlined the lack of similar studies and called for action on more research on the characteristics of an innovative teacher.

Akça and Şakar (2017), on the other hand, investigated the levels of innovation on preservice teachers with regards to their genders. The Individual Innovativeness Scale was administered to 164 preservice teachers. The results of the study indicated that there was no statistically significant difference between genders. Still, the researchers suggested the design and implementation of extracurricular activities that might boost preservice teachers' cultural and social developments.

Finally, Örün, Orhan, Dönmez and Kurt (2015) conducted a research study with survey design. The aim of the research was to "investigate the correlation between individual innovativeness and technology attitudes of teacher candidates" (p. 65). The researchers administered two scales called "Individual Innovation Scale" and "Technology Attitude Scale" to 422 preservice teachers selected via stratified sampling. According to the results of the study, while a positive significant correlation between preservice

teachers' innovativeness levels and attitudes towards technology was disclosed, the level of innovativeness of preservice teachers did not significant vary in terms of their departments and grade levels. In conclusion, they suggested that more comprehensive research on the topic is required to get a better picture of preservice teachers in Turkey.

2.10.2 Critical Thinking and Problem Solving

Critical thinking has condensed into a comprehensive skill over years encompassing logical thinking, argumentation, decision making and problem-solving (Butler et al., 2012; Halpern, 2003; Ventura, Lai, & DiCerbo, 2017). Probably for that reason, while critical thinking has accommodated both conceptualization studies and research aiming to estimate preservice teachers' ability levels, the dominant focus of problem-solving studies has been merely on the latter. Fortunately, these quantitative studies focusing on ability levels of individuals on the skills also included some individual variables such as gender and department to provide the literature with more explicit results. In that sense, the studies related to critical thinking and problem-solving are expressed in the following paragraphs with regards to their conceptualizations and the skill levels preservice teachers have.

First, Kanık (2010) carried out a study with an aim to reveal in-service teachers' conceptualizations of critical thinking and implementation of its development in some specific lessons on primary school level such as mathematics, social sciences, science and technology. The study employed in-depth interviews with 70 in-service teachers working in 14 elementary schools. From extensive qualitative data analysis, the study revealed 4 themes in general. They were aims of critical thinking implementation, its association with higher order thinking skills, cognitive abilities related to the skill, and some dispositions that critical thinkers embody. While the first theme involved clarification of an issue to understand it explicitly, reasoning, and problem-solving, the second theme covered the association of critical thinking with both creativity and problem-solving. What is more, the third theme called cognitive abilities of the related skill incorporated various indicators such as developing different approaches to issue examination, conclusion construction depending on prior knowledge and observation,

active listening, and analyzation of resemblances and discrepancy in a system of knowledge. Additionally, some dispositions related to the skill were responsibleness, confidence, keen on questioning, and also being broadminded and sensitive. In conclusion, although in-service teachers showed an overall understanding of the notion critical thinking, the researcher underlined a need on raising teachers who pay attention to their self-improvement, so they continue developing themselves to catch up with the pace of innovation around to raise resourceful citizens of tomorrow.

Studies investigating levels of critical thinking preservice teachers have developed also exist in the literature. That being said, Demiral (2018) examined the levels of critical thinking skill science preservice teachers possess through a mixed method study. While 200 preservice teachers participated in the quantitative part which employed the Watson Glaser Critical Thinking Appraisal scale to determine their levels on the skill, 14 preservice teachers participated in interviews to further examine their perceptions on their skill levels and reasons to score high or low on the previous part. The results indicated that the skill levels do not differ significantly according to preservice teachers' genders. In conclusion, the researcher suggested that the development of prospective teachers' critical thinking skill should be supported with scientific and cultural extracurricular activities designed in the scope of and relation to teacher education programs.

Moreover, Erdem and Yazıcıoğlu (2015) examined preservice teachers' tendency levels on critical thinking. The examination also looked for a significant difference between the estimated levels and some individual variables such as gender and department. Through a cluster sampling method, 924 preservice teachers from 11 teacher preparation programs participated in the study. A data collection tool called "Critical Thinking Tendency" scale was administered to the participants. The results highlighted that the tendency levels of preservice teachers on critical thinking significantly differ depending on their genders and departments. Regarding the gender variable, males have indicated a higher tendency on critical thinking than females. According to the interdepartmental calculations, while the Department of Elementary

Science Education scored the highest just after Arts Education, the same department's estimated tendency level on critical thinking was significantly higher than some other departments including Early Childhood Education and Foreign Language Education. As a conclusion, the researchers suggested an increase in a number of activities related to the development of critical thinking in preservice teacher education and recommended carrying out more research examining critical thinking levels of preservice teachers depending on their genders and departments.

On the other hand, Çetinkaya (2011) also investigated tendency levels of preservice teachers on the same skill. The California Critical Thinking Disposition Inventory was administered to 195 preservice teachers studying in the Department of Turkish Education. This scale was composed of 5 subdomains for critical thinking, and they were respectively; analyticity, open-mindedness, inquisitiveness, self-confidence, truth-seeking, and systematicity. According to the quantitative results, female preservice teachers' tendency levels were significantly higher than males with regards to analyticity, open-mindedness and truth-seeking. Finally, it was suggested that the reasons for such a significant difference among genders should be investigated in further studies.

Furthermore, Gülveren (2007) probed the relationship between preservice teachers' critical thinking levels and various individual variables including gender and department. The study administered the Cornell Critical Thinking Test to estimate the levels, and 1302 preservice teachers from 5 teacher preparation programs participated in the test. For the gender variable, there found an evident and significant difference in favour of female preservice teachers, especially on the domains; identifications of assumptions and deduction. Additionally, no significant interdepartmental difference was found according to the analysis. Therefore, the researcher concluded that since an ability to think critically can be improved through education, teacher education programs should facilitate the development of the skill on preservice teachers by providing them with more opportunities to learn and experience the use of various thinking strategies and methods.

Second, Son and Lee (2016) carried out qualitative research via an open-ended questionnaire with 96 preservice teachers from two universities with an aim to explore their conceptions of problem solving. Their study investigated and revealed problem solving mainly in a competency level, which means that their findings were accumulated under knowledge, skill and disposition categories. According to the findings on the skill level, preservice teachers lack a systematic approach to problem solving. Moreover, the skill level was further divided into categories of generic and teaching abilities. For both categories, preservice teachers' answers were narrow. On the other hand, the attitude level covered 5 themes and they were creative, collaborative, effort-driven, open-minded and patient. In conclusion, they called teacher educators for action on providing preservice teachers with more opportunities to enable them to explore and better comprehend the nature of problem-solving including methods and techniques.

Even though studies on the conceptualization of problem-solving by preservice teachers is extremely limited (Son & Lee, 2016), there at least are some studies examined the skill level in preservice teachers. For example, Erdem and Yazıcıoğlu (2015) probed to what extent some individual variables including gender and department predict preservice teachers' levels on both critical thinking and problem-solving. Besides, the study also aimed to look for a correlation between the level of critical thinking and problem-solving. Thereof, the data collection instruments were the "Problem Solving Inventory" and "Critical Thinking Tendency Scale". In total, 924 preservice teachers from 11 teacher preparation programs participated in the study. According to the results, it was revealed that while gender was significantly predicting the preservice teachers' level of problem-solving, the department variable was not. On the other hand, gender and department were variables significantly predicting the critical thinking tendencies of preservice teachers. Last but not least, a positive correlation between the level of problem-solving and a tendency on critical thinking was found as well. In the end, it was concluded that any investment by a teacher education program such as an extracurricular activity on the development of preservice

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teachers' problem-solving skills might result in an increase on preservice teachers' tendencies towards critical thinking.

Furthermore, Kutluca (2018) carried out a study with an aim to examine discrepancy on levels of preservice teachers' problem-solving abilities with regards to gender, class levels and their departments. Besides, the researcher included affective and cognitive variables such as motivation, creative thinking and critical thinking to reveal to what extent these additional variables predict their problem-solving skill levels. The study administered an assessment booklet encompassing an interpersonal problem-solving inventory and six different data collection tools to 471 preservice teachers from five teacher education programs. The results showed that the levels of problem-solving prospective teachers possess did not differ significantly by gender and department and revealed that preservice teacher's ability levels on creative thinking and critical thinking were significant predictors of their levels on problem-solving. Consequently, the researcher suggested that further studies related to teacher education should not ignore creative thinking and critical thinking when they focus on problem-solving.

Last but not least, Yiğitcan-Nayir and Tekmen (2017) carried out a compact study with aims both to explore academic motivations and problem-solving skills that preservice teachers possess with regards to several variables and to inspect learning environments in the sense of academic motivation and problem-solving skills. Employing survey research design, this study administered two data collection tools called Problem Solving Ability Inventory and Academic Motivation Scale to 219 junior and senior preservice teachers from five teacher preparation programs. The results underlined that the levels of problem-solving preservice teachers possess did not significantly differ according to their departments. Furthermore, the intense analysis showed that their perceptions of their problem-solving abilities associated with their problem-solving experiences in their learning environments. Consequently, the researchers concluded that an effort on providing preservice teachers with either curricular or extracurricular motivation-booster activities avails them of a boost in the development of their problem-solving skills.

2.10.3 Collaboration

Due to its undeniable relation with and within education, collaboration as a skill has remained one of the fundamental educational attainments and taken its place in all noted 21st-century skill frameworks (Voogt & Roblin, 2012). However, collaboration has dominantly been examined and considered as either learning or teaching method from an educational perspective (Lai, DiCerbo & Foltz, 2017). Moreover, a consideration of collaboration as a skill itself has raised with the 21st-century movement (Griffin, Care & McGaw, 2012; Trilling & Fadel, 2009). In that sense, collaboration as another skill in 4Cs is mainly identified as an ability to interact with individuals in order to work together toward a common goal (Lai, DiCerbo & Foltz, 2017). Yet, after an extensive examination of the studies carried out, it becomes clear that while studies on collaboration in preservice teacher education accommodate research related to conceptualization of collaboration, they lack quantitative examination of the skill level probably due to the former view on the notion. Therefore, the related studies are expressed in the following paragraphs with regards to their conceptualizations preservice teachers hold.

To begin with, Gentry (2012) carried out a qualitative study with an aim to examine which collaboration skills preservice teachers in one teacher education program acquire and lack the most. For that reason, the researcher developed an open-ended opinionnaire similar to a self-report and administered it to 28 preservice teachers. Before the analysis, the researcher determined seven competencies that teachers in the 21st century need to acquire to effectively collaborate with parents of exceptional children. These were advocacy, commitment, communication, equality, professional competence, respect and trust. Then, 71 answers were distributed under each related competency. The results indicated that the preservice teachers mostly highlighted their proficiencies on the areas of communication and professional competence. However, the remaining competencies received the lower frequencies among all answers. Consequently, the researcher discussed that although communication and professional competence are crucial factors maximizing the parent-teacher collaboration in a

learning environment, it must be ensured that the remaining competencies are also acquired by preservice teachers as much as the others. Accordingly, it was suggested teacher education curriculum shall include and cover collaboration as a skill more structurally to train teachers who can effectively and skilfully collaborate in learning environments.

In another research, Koç-Erdamar and Demirel (2010) aimed to reveal the characteristics and problems of teamwork from preservice teachers' perspectives. Embodying a mixed method design, the study administered an open-ended questionnaire to 245 preservice teachers from a faculty of vocational education and conducted 5 semi-structured group interviews with 15 preservice teachers in total. The results showed that while teamwork or collaboration transfers crucial abilities such as public-speaking, approaching and seeing from a different point of view, and teaching, problems related to it include low interpersonal management experiences of preservice teachers and lack of ability on regulating task-distribution. In detail, some of the revealed characteristics of teamwork were as follow (Koç-Erdamar & Demirel, 2010):

- Public-speaking
- Recognition of different points of a view
- Teaching
- Enhancement of communication between teachers and learners
- Self-confidence
- Responsibility
- Researching
- Sharing, cooperation and solidarity
- Meaningful and permanent learning
- Affiliation
- Problem-solving

Based on data collected through the interviews, it was underlined that although teacher education programs in the faculty utilize collaborative learning and foster prospective

teachers to collaborate through learning activities and projects, same methods are employed almost all courses. Hence, it was concluded that teacher education programs should consider handling various approaches and practices to cultivate their experiences on collaboration.

Furthermore, Ammentorp and Madden (2018) published an article focusing on workplace collaboration and expressing their own experiences with preservice teachers from the departments of Elementary and Early Childhood Education. Mainly, the aim was to propose a framework that outlines both challenges teachers face in their working environments and methods to enhance collaboration skills preservice teachers possess. In the article, the former outline covered the challenges caused by unmotivated or unprofessional partners in teamwork such as unequal efforts among collaborators, inhibiting emotional inharmonies such as negative mood, and clashing interpersonal norms such as racist attitudes. Therefore, regarding the latter or methods to foster collaborative experiences of preservice teachers, it was highlighted that they need to learn how to moderate the effect of such personas on teamwork. In that sense, the researchers suggested that teacher preparation programs ought to focus both on transferring the importance of utilizing negative experiences as learning opportunities and on developing prospective teachers' interpersonal coping skills as well. In conclusion, teacher education programs should invest attention in developing their students' collaboration skills to better prepare them for the workplace.

2.10.4 Communication

Communication as a skill has been an exceptionally pivotal educational outcome in each formal educational program all over the globe. Embodying various forms such as verbal or nonverbal, and linguistic or non-linguistic, communication as a skill is mainly characterized as an ability to engage in "a social process in which information is exchanged in order to establish shared meaning and to achieve desired outcomes" (Metusalem, Belenky & DiCerbo, 2017, p. 5). After an extensive examination of the studies carried out, it becomes clear that while studies on communication in preservice teacher education accommodate research related to quantitative examination of the

skill level, the literature lack studies probing its conceptualization by preservice teachers. In that sense, the studies related to the level of communication skill preservice teachers possess are expressed in the following paragraphs.

To start with, Milli and Yağcı (2017) carried out a quantitative study to investigate the level of communication skill preservice teachers have. In the study, the researchers administered a scale called Communication Skills Scale to 458 preservice teachers from 4 teacher preparation programs. After the data analysis, it was found that there exists a significant difference in the estimated levels of communication skill depending on preservice teachers' genders in favour of females. Moreover, a significant interdepartmental difference was also revealed. Thereof, regarding the results, the researchers called teacher education programs for consideration of their programs and utilization of purposefully designed extracurricular activities to eliminate the gender and interdepartmental difference of preservice teachers' levels on the skill.

Moreover, Ocak and Erşen (2015) also examined the communication skill level of prospective teachers with regards to several variables including gender and department. In total, 315 students from 7 teacher preparation programs participated in the study. The researchers implemented a scale called the Communication Skills Evaluation Scale. According to the results, preservice teachers' communication skill levels significantly differed according to their genders and departments. To be more explicit, the gender difference was in favour of females. What is more, while the highest score belonged to the Department of Elementary School Education, the lowest score belonged to the Department of Computer Education and Instructional Technology. In conclusion, the researchers suggested that specific courses on communication shall be developed and added to the curriculum of teacher preparation programs.

In another quantitative study, Tan and Tan (2016) investigated the relationship between communication skills and classroom management skills. Additionally, individual variables such as gender and department were also added into the examination. In total, 349 preservice teachers from 6 teacher education programs

including departments of Mathematics Education, Elementary Science Education and Computer Education and Instructional Technology participated in the study. To determine both skill levels, scales named Communication Skills Evaluation Scale and Classroom Management Scale were used. After the data analysis, a significant gender difference was evident for communication skill in favour of females. On the other hand, it was revealed that neither classroom management nor communication skill levels significantly differ in terms of preservice teachers' departments. Besides, a moderate positive relationship was revealed between two dependent variables. Considering these findings of the study, the researchers recommended that an action needs to be taken by teacher education stakeholders to eliminate the apparent gender difference in communication skill.

Furthermore, Baykara-Pehlivan (2005) carried out a study on a quantitative examination of the variance in preservice teachers' perceptions of their communication skills in terms of individual variables such as gender and grade level. The researcher administered a data collection tool called Communication Skills Evaluation Scale to 592 preservice teachers studying in the Department of Primary School Education. The results indicated that there was no significant difference in communication skills regarding the participants' genders. However, a statistically significant difference was found between freshmen and senior students in favour of the latter indicating that maturation matters to develop communication skills. In the end, it was concluded that a follow-up study is required to check if their perceptions of the same skill differ after they become in-service teachers.

Last but not least, Elkatmış and Ünal (2014) also probed preservice teachers' communication skill levels in terms of several variables including gender. In the study, a data collection tool named Communication Skill Inventory was administered to 280 junior and senior preservice teachers from the Department of Primary School Education. According to the results, it was disclosed that the estimated skill levels did not significantly differ based on gender. In the end, it was concluded that gender does

not influence the communication skill levels of preservice teachers, but extensive research is also needed to further investigate the issue.

2.11 Summary

In the present chapter, related literature and research studies on learning and innovation skills were reviewed in addition to historical background of 21st century competencies, their attributes and the movements' influence on international and national curriculum including teacher preparation programs. Depending on the presented literature, it can be said that learning and innovation skills are crucial tools of citizens of tomorrow including students and teachers as well. Equipping citizens with these essentials during schooling is among the responsibilities of teachers in the 21st century. However, to make it possible, teachers should possess them at first. Therefore, to ensure successful transmission of those skills to the younger generation through educational programs, it must first be assured that teacher education programs adequately convey the skills to teachers of tomorrow.

Creativity and innovation are among the learning and innovation skills. They have always been considered as an important educational outcome in curriculum including teacher training programs (Griffin, McGaw, & Care, 2012). However, there still exists a concern about these skills' transmission through schooling. The issue is related to curriculum as a whole. First, these skills necessitate some level of autonomy from individuals, which in turn requires learning environment not to be limiting (Craft, 2003). Otherwise, teachers cannot convey the skill successfully to youth (Westby & Dawson, 1995). In this context, Beghetto (2007) revealed that teachers with more experiences either in teaching or utilizing the mentioned skills in daily life become more successful in transmission of the skills through their classes no matter the type of curriculum they are employing. On the other hand, Beghetto (2007) adds novice teachers with less experience in creativity and innovation tend to avoid implementing activities supporting the mentioned skill and prefer instructional tasks with definite steps or known answers, which definitely blocks the acquisition of the skills by learners. Considering these, successful development of the skills in schooling level

demands actions and improvements in the very beginning; boosting preservice teachers' creativity and innovation during their teacher education programs.

As another skill in the learning and innovation skill set, critical thinking, contextually covering problem-solving, has been considered as an important element of fundamental skills involved in both the legacy and contemporary curriculum. In this century, the significance of mastering in critical thinking has gradually overflown the boundaries of learning environments towards every aspect of life (National Education Association, 2014). Yet, the learning environments are the best places where individuals may start excelling at the skill before starting to survive in the jungle of the business sector. Hence, faculty of educations carry a vital responsibility to equip prospective teachers with critical thinking to enable an opportune and successful transmission of the skill to next generations (Williams, 2005). Thereof, ensuring teacher education programs transfer critical thinking skills to preservice teachers not just to enable them as an agency in delivering the skill but also to strengthen their attitude on improving their own critical thinking skill throughout life is a crucial assessment that teacher education researchers should pay attention on (Varga, 2011).

Due to its undeniable relation with and within education, collaboration as a skill has remained as one of the fundamental educational attainments (Voogt & Roblin, 2012). However, throughout years, the notion of collaboration has been perceived from two distinctive perspectives; either as a style of teaching and learning or as a skill itself (Lai, DiCerbo & Foltz, 2017). Due to the fact that the former approach in learning environments does not necessarily facilitate mastering at the latter (Le, Janssen & Wubbels, 2018), collaboration as a skill requires a deliberate attention in curricula since a failure at proficiency in the skill during school years results in individuals with a disadvantage in and outside of workspace (Kuhn, 2015). Therefore, to enable opportune skill transfer to next generation entails ensuring successful attainment of skills by teachers of tomorrow during teacher education programs. It is crucial to equip them with the collaboration skill for their professional career as a teacher in a school environment (Gentry, 2012). Yet, teacher education programs lack both required and

expected focus directly oriented at the development of the collaboration skill itself (Weiss, Pellegrino & Brigham, 2017). Thereof, it is essential to assess to the extent of which teacher education programs prepare preservice teachers with generic collaboration skill.

Due to its existence as a prevailing skill like collaboration, communication has always found itself a place among educational outcomes (Voogt & Roblin, 2012). Moreover, communication has been the ultimate attribute of the teaching profession. Therefore, it is of no significance to say teacher education program does not convey the communication skill at all (Hunt, Wright & Simonds, 2014). However, for both individuals and societies to take advantage of the skill's benefits: helping individuals have lucrative and vigorous intrapersonal and interpersonal relationships (Barker, 2006; Downing, 2005; Levine, 2005; McCracken, 2006), enabling individuals as more social citizens to societies (Berry, 2005; Du-Babcock, 2006; Scudder, 2004), and enhancing the quality of shared information and, in return, the quality of learning (Martin & Myers, 2006; Myers, Martin & Knapp, 2005), teachers should possess the communication skill at an expert-level. In that sense, scholars continuously utter the need to assess teacher education programs in terms of transferring the ultimate attribute of the profession to prospective teachers (Coggshall, 2007; Khan, Khan, Zia-Ul-Islam & Khan, 2017).

All in all, the expectations from teachers has grown when compared to the previous century. In such a demanding era, unfortunately, not all teacher education programs, as Darling-Hammond (2006) warns and underlines, prepare teachers of tomorrow with the same level of 21st-century skills. Yet, the related studies of each skill in learning and innovation skill set existing in the literature confirm the tragedy of incontestable variance either in preservice teachers' conceptions of the skill or in their levels. Taking all these findings in the reviewed literature and warnings from scholars into account, the purpose of the current study is mainly to investigate preservice teachers' perceptions of their preparedness levels on the crucial skill set.

CHAPTER 3

METHOD

This chapter introduces the method used for the research. It respectively includes and mentions in detail about the overall design of the study, subjects of the study, data collection instrument, validity and reliability of the data collection instrument, procedures utilized for data collection, and data analysis, and limitations of the study.

3.1 Design of the Study

The present research utilized survey design method. The survey design method is employed whenever the interest of research is either to describe or to make inferences about a population. According to Fraenkel, Wallen and Hyun (2011), a study implementing survey design is characterized by three main aspects of the method. First, research questions are interested in describing some attributes of a group of people representing a particular population. Second, survey studies use data collection instruments including carefully prepared questions about attributes in research interest and answers from that particular group of people composes the data. The last but not least, studies in this design generally covers a sample since in many cases it is impossible to reach to an entire population.

Moreover, one of the most utilized types of survey design is a cross-sectional survey (Fraenkel, Wallen & Hyun, 2011). Cross-sectional studies basically produce a snapshot of a population about the topic of which the study focuses on (Lavrakas, 2008). Therefore, the main issue in cross-sectional design is to collect data at around the same time from either a sample or the entire population. Yet, no matter what type

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of design is selected, the survey method necessitates some sequential steps in the design process of research (Fraenkel, Wallen & Hyun, 2011). In that sense, the following paragraphs explain the research content in consecutive steps of carrying out a survey study.

Regarding the characteristics of a survey study, this research mainly aimed to examine to what extent teacher education programs educate senior students' preparedness levels on learning and innovation skills through a cross-sectional survey research. In this cross-sectional survey research, the very first step was to define the problem. For that reason, an extensive literature review was conducted, and the problem was defined within a combination of three main issues: (1) non-equivalent preparation level of graduates for teaching profession and the profession's requirements, and demands in the 21st century (Darling-Hammond, 2006; Darling-Hammond, Chung, & Frelow, 2002; Darling-Hammond, 1997), (2) a lack of studies on 21st century skills in the preservice level (Urbani, Roshandel, Michaels & Truesdell, 2017), and (3) a continuous need for an up-to-date examination of preservice teachers' perspectives on their education (Eret-Orhan, Ok & Capa-Aydin, 2017). Furthermore, the problem was specifically directed towards learning and innovation skills, encompassing 4Cs (creativity and innovation, critical thinking and problem solving, collaboration, and communication), depending on their importance ascribed as the essential skills to "separate students who are prepared for increasingly complex life and work environments in the 21st century, and those who are not" (P21, 2015, p. 37).

The literature was also looked for possible independent variables that may cause significant variations in the dependent variables, which were the calculated preparedness levels. Accordingly, the independent variables included in this study are gender and department type. Hereby, the research questions were formed as follow:

1. What indicators explain the 21st-century learning and innovation skills from the perceptions of preservice teachers in a research-university?

2. To what extent does the teacher education program offered in the research-university prepare future teachers to possess the 21st-century learning and innovation skills based on preservice teachers' perceptions?

3. Are there significant differences in the extent the teacher education program prepares future teachers to possess the 21st-century learning and innovation skills in terms of gender and department?

First, the target population for this study was defined as all prospective teachers in the faculty of education at a prestigious state research university located in the north-western part of central Anatolia region of Turkey. However, the study population contains all senior students enrolled in the faculty at the university. The reason behind this concentration was to increase the comprehensiveness of possible results at least to some degree. That is, it was more logical to ask the senior students to evaluate their teacher education programs than to ask the rest, and the interpretations of findings, in this way, became more accurate. Second, to develop a questionnaire containing indicators of learning and innovation skills, the current study was divided into two consecutive phases. Phase I aiming to ask prospective teachers to share their mindset on indicators of teachers possessing the learning and innovation skills. For that reason, an opinionnaire named OHILIS containing one open-ended question for each skill was developed and administered to junior students (N=54) at the same faculty on the last month of the spring semester within 2017-2018 academic year. After an inductive content analysis of the data from the first phase in this study and a comprehensive examination of indicators proposed under models of the skills in literature, a questionnaire called PLeSLIS was constructed.

During the years when the current study was carried out, the faculty of education had been accommodating eight teacher education programs. Therefore, employing a convenience sampling method, the researcher tried to reach all senior students enrolled in these programs during the last two weeks of the fall semester in the 2018-2019 academic year. In total, 205 students voluntarily participated in the data collection. Then, the gathered data in phase II was analysed using both the IBM SPSS METU

Version 20 for Windows 64-bit operating system and NVivo12 Student Trial. In addition to the results of qualitative data from one open-ended part in the questionnaire, both descriptive and inferential statistics revealed from the data analysis was reported in the following chapter.
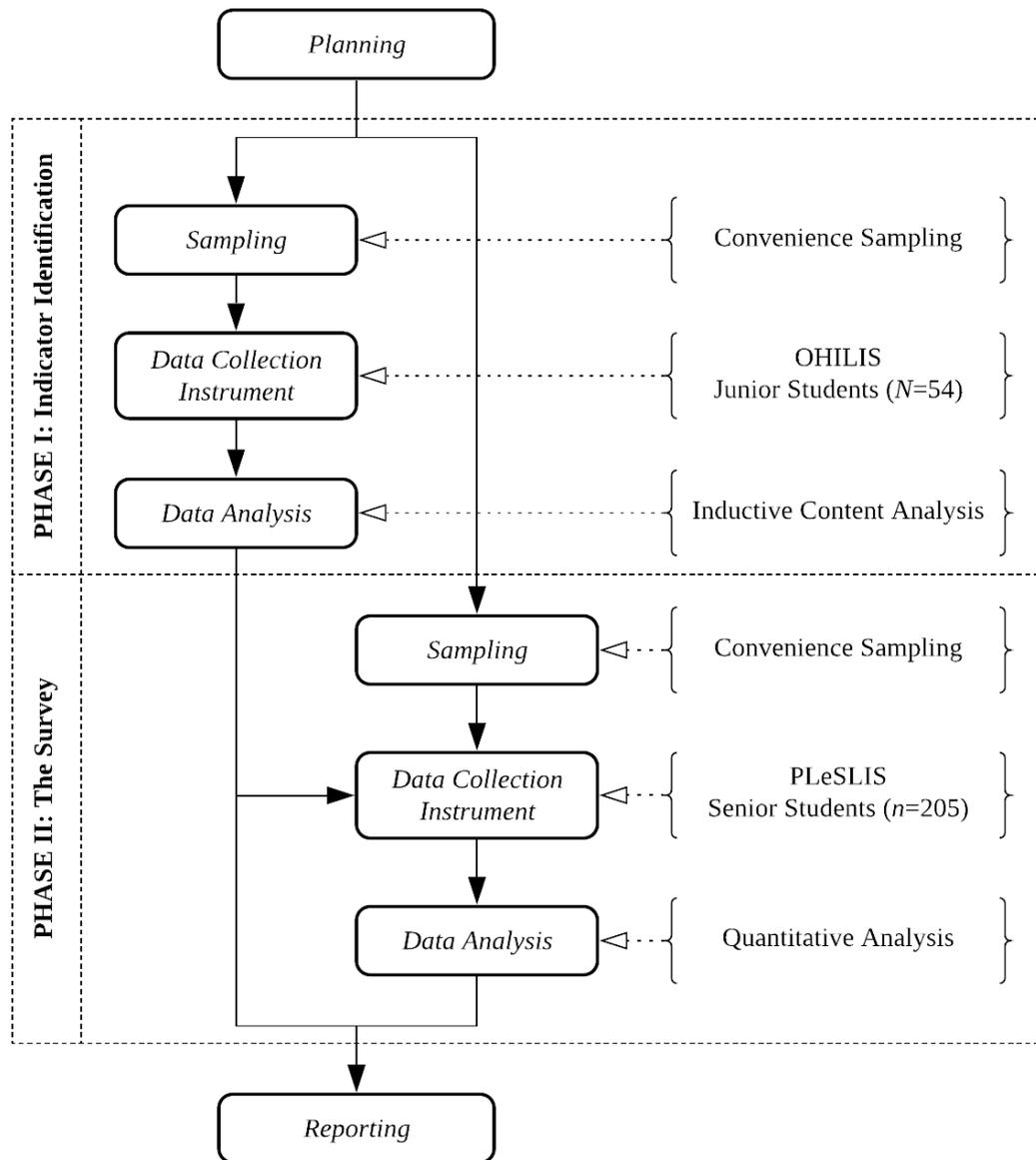
Figure 3.1 Research Design of the Study

3.2 Subjects of the Study

Mainly, the target population for this study was defined as all prospective teachers in the faculty of education at a prestigious state university located in the north-western part of central Anatolia region of Turkey. However, the accessible population was determined to contain all senior students ($N=345$) enrolled in the faculty at the university. The reason behind this concentration was to increase the generalizability of possible results at least to some degree. That is, since the aim was to investigate summative results of teacher education programs' preparedness levels on learning and innovation skills from preservice teachers' perspectives, it was more logical to ask the senior students to evaluate their overall teacher education programs in terms of the skill set than to ask the rest. In this way, the interpretations of findings were expected to become more accurate.

On the other hand, since this research included both Phase I with an opinionnaire for identifying indicators of the learning and innovation skills from preservice teachers' perspectives and Phase II with a developed questionnaire from findings of Phase I, there were two seemingly distinctive but contextually same samples representing the identical accessible population. First, the primary study (Phase I) was administered to junior students ($N=54$) studying in the faculty of education during the last two weeks of the spring semester within 2017-2018 academic year at the previously mentioned university. After indicators were determined and the Phase II data collection tool was formed, the questionnaire was administered to senior students ($N=206$) enrolled at the same faculty of the same university during the last two weeks of fall semester within the 2018-2019 academic year. That is, almost all participants of Phase I at the end of the 2017-2018 academic year were theoretically expected to be participants of Phase II at the end of the fall semester within the following academic year. However, while 206 senior preservice teachers participated in Phase II, only one participant did not want to complete the questionnaire and left half of the items unanswered. Therefore, it was removed from the analysis and 205 questionnaires were included into the study. Table 3.1 is to illustrate the overall participation.

Table 3.1

Number of Participants in Phase I and Phase II

Phases	Administered	Received	Return rate
Phase I	54	54	100%
Phase II	206	205	99.5%

The faculty of education at the university where the study was carried on during 2017-2018 and 2018-2019 academic years were accommodating eight teacher education programs within its bachelor's degree programs. These were departments of Computer Education and Instructional Technology (CEIT), Elementary Science Education (ESE), Elementary Mathematics Education (EME), Physics Education (PHED), Chemistry Education (CHED), Mathematics Education (MHED), Early Childhood Education (ECE), and Foreign Languages Education (FLE). While the Phase I with an open-ended opinionnaire only included participants from the departments of Computer Education and Instructional Technology (n=3), Elementary Mathematics Education (n=1), Elementary Science Education (n=23), and Foreign Language Education (n=27), the second phase reached to all eight departments.

Table 3.2

Participant Distribution According to Gender

Gender	n	%
Female	171	83.4
Male	34	16.6

Moreover, in Phase II as shown in Table 3.2, while 83.4% of the participants were female (n=171), the remaining 16.6% represented male participants (n=34). Seemingly, the female students outnumbered male participants. To illustrate the overall distribution, Table 3.2 sorted in a descending percentage value indicate participants distribution of Phase II regarding their genders.

To illustrate the overall distribution, Table 3.3 sorted in a descending percentage value indicate participants distribution of Phase II regarding both their genders and departments.

Table 3.3

Participant Distribution According to Gender and Department

Departments	Female	Male	*n*	%
FLE	44	9	53	25.9
ESE	36	2	38	18.5
EME	35	2	37	18.0
ECE	29	0	29	14.1
CEIT	10	17	27	13.2
MHED	7	1	8	3.9
CHED	6	1	7	3.4
PHED	4	2	6	2.9

To illustrate the overall distribution regarding participants' gender and age, Table 3.4 indicates participants distribution of the main study.

Table 3.4

Participant Distribution According to Gender and Age

Age	Female	Male	*n*	%
25 or more	15	8	23	11.3
24	22	6	28	13.7
23	45	7	52	25.4
22	66	9	75	36.6
21 or less	23	4	27	13.2

In the questionnaire, since participants' calculations of their own age sometimes become confusing during filling out, an open-ended demographic question about their birth year was added for the researcher to calculate their ages during analysis. Therefore, it is necessary to mention that the year 2018 is taken as the base year for calculation in this study. Regarding the consideration, the age range of the participants (N=205) was between 33 and 20.

3.3 Data Collection Instrument

As mentioned beforehand, a survey design was employed throughout this research. However, survey design may utilize a variety of method in data collection parts. In this research, a self-administered opinionnaire for Phase I and a self-administered questionnaire for Phase II was developed and employed in order to provide answers to the research questions. Fowler and Floyd (2013) underline that one reason to employ a survey study is to fill information gaps found in the literature or for a specific interest. In that sense, relying on the previously defined problem statement for this research, it was decided to develop and utilize a specific opinionnaire and an *ad-hoc* questionnaire.

3.3.1 Instrument Development Process

In the current study, two main data collection tools were required to be developed to enable the researcher to answer the research questions. In that sense, while a specific opinionnaire was required to provide the first research question with an answer, which corresponds to the first phase of the study or Phase I, an *ad-hoc* questionnaire was needed for the remaining two research question or Phase II. Thereof, the following paragraphs explain the development of data collection tools for both phases.

3.3.1.1 Opinionnaire Hunting Indicators of Learning and Innovation Skills

The aim of developing the OHILIS was both to reveal indicators of a teacher possessing learning and innovation skills from preservice teachers' perspectives and to gather relevant generic indicators into an item pool for development of the main

data collection tool. Considering that the learning and innovation skill set is composed of four generic skills as follow: creativity and innovation, critical thinking and problem solving, collaboration, and communication, the first version of OHILIS was, therefore, formed with four open-ended questions and one demographic question for the department of participants. Then, the opinionnaire, OHILIS, was consulted to an expert, the thesis supervisor, with a specialization in teacher education in the Department of Educational Sciences. The expert in the field advised dividing each question about skills with more than one dimension (creativity and innovation, and critical thinking and problem solving) into two different questions to avoid confusion both for participants in filling-out and for the researcher in data analysis. After taking valuable advice into consideration, the related changes were applied. Thus, the final version of OHILIS was ready to be administered with six questions. Figure 3.2 is to illustrate the mentioned process of developing the opinionnaire.
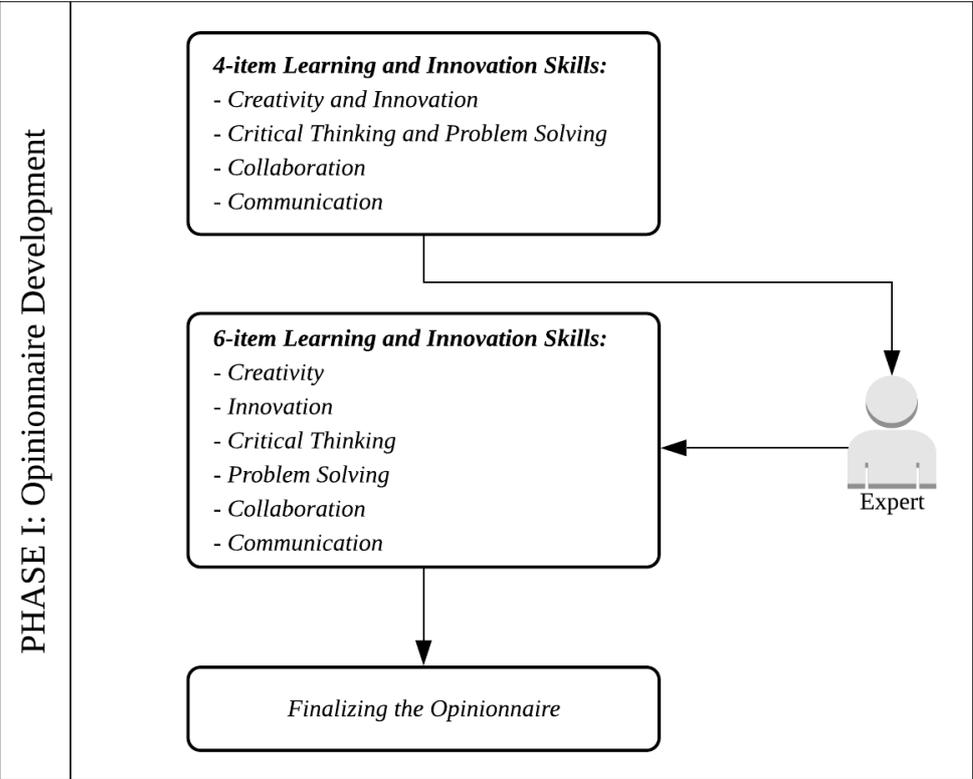
Figure 3.2 Phase I: OHILIS Development Process

Table 3.5 is to provide an overall picture of questions included in the opinionnaire.

Table 3.5

Questions in the Final Version of OHILIS

Learning and Innovation Skills	Open-Ended Questions: "What are the indicators of"
Creativity	A creative teacher?
Innovation	An innovative teacher?
Critical Thinking	A teacher who is a critical thinker?
Problem Solving	A teacher who is a problem solver?
Collaboration	A collaborative teacher?
Communication	A teacher with a good level of communication skill?

3.3.1.2 Preparedness Level Survey on Learning and Innovation Skills

3.3.1.2.1 Item Generation Process

For this research, the process of indicator identification for learning and innovation skills was a preliminary work that was supposed to be carried out to have an item pool for development of the Phase II data collection tool; a questionnaire called Preparedness Level Survey on Learning and Innovation Skills (PLeSLIS). In that sense, the process was divided into two extensive segments. First, since the study is to examine teacher education programs' preparedness levels on the specific skill set from preservice teachers' perspectives, consulting to preservice teachers from the target population by implementing a specifically developed opinionnaire containing open-ended questions asking preservice teachers to write down at least three indicators of an ideal teacher possessing each learning and innovation skill comprised the first phase in the current study. In addition to the results of Phase I contributing to the development of an item pool for Phase II, an extensive examination of indicators proposed in the related literature for learning and innovation skills was another process carried out during the same time interval including the collection of data with the developed opinionnaire called OHILIS and its analysis, with an aim to enrich the

generated item pool for development of the questionnaire named PLeSLIS. All process carried out for item pool generation is illustrated in Figure 3.3.
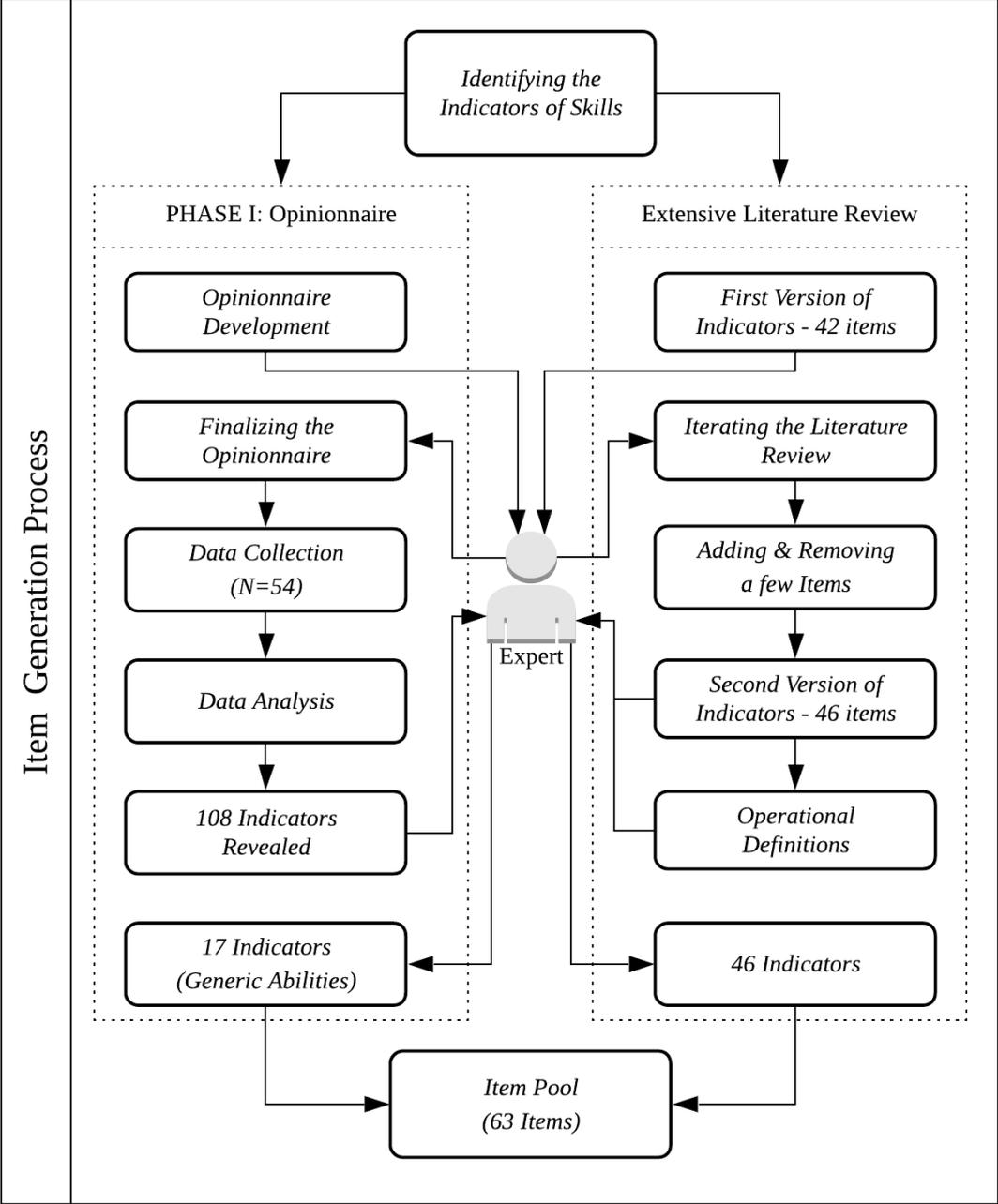
Figure 3.3 Item Generation Process

3.3.1.2.2 Indicators Included from OHILIS

The prepared opinionnaire, OHILIS, was administered to 54 junior students attending to the service courses given by the faculty of education during the last week of the spring semester in the 2017-2018 academic year. After the data collection and analysis processes, 108 indicators were revealed in total. The analysis resulted in the formation of 18 creativity indicators, 11 innovation indicators, 17 critical thinking indicators, 20 problem-solving indicators, 16 collaboration indicators, and 26 communication indicators.

Moreover, an inductive content analysis was carried out and two-level classification was applied to the revealed items. In that sense, while the first level categorization was supplied from the logic existed in the literature (Greenhill, 2010) as either being generic or teaching-related, the second level was assigned after a semantic analysis on the same items as either skill-specific dispositions or abilities representing the related skills.

Then, all revealed items or indicators of the skills were examined under their corresponding classifications and considered with the same expert in the field of teacher education whose opinions were employed during the development of OHILIS. After extensive considerations, only some items labelled as generic-abilities (first-second level classification), aligning with the focus in this study, were decided to be included in the item pool, and a few items under the generic-ability classifications were reconstructed with implementation of either item reduction or rewording respectively due to the overlapping issue and possible misconception that may occur. Consequently, 17 items were involved in the item pool from OHILIS. While no item for innovation was revealed from the preservice teachers' perspectives, some items for the remaining learning and innovation skills were as follow: an ability to produce novel ideas, an ability to see the logic and point of view behind explanations, an ability to see the root of an incident or a problem, an ability to ask for help from others without hesitation, and an ability to empathize. Table 3.6 is to show sample items revealed from OHILIS.

Table 3.6

Sample Items/Indicators Revealed from Phase I: OHILIS

Skills	Sample Items - Indicators
Creativity	An ability to produce novel ideas
Innovation	None (no generic indicator revealed)
Critical Thinking	An ability to see the logic and point of view behind explanations
Problem Solving	An ability to see the root of an incident or a problem
Collaboration	An ability to ask for help from others without hesitation
Communication	An ability to empathize

3.3.1.2.3 Extensive Literature Review for Operational Definitions and Indicators

During the same time interval including the collection of data with the developed OHILIS and its analysis, an extensive literature review to identify indicators existing and suggested in other research studies was carried out. As mentioned in the literature review chapter of this research, there were tons of different models for these skills reflecting a variety of approaches. Yet, depending on the fact that a teacher education program is expected to prepare teachers of tomorrow to possess beside to teach and assess those demanding skills (Greenhill, 2010), the utter concentration on handling only generic skills in this research rather than skills associated with teaching and assessment has become a helpful separating factor during both segments of the item generation process.

After narrowing the literature down in this way, the first version of indicators encompassed 4 items for creativity and innovation, 16 items for critical thinking and problem solving, 9 items for collaboration, and 13 items for communication. However, when the expert in the field of teacher education scrutinized the collected items from literature, her advice led not only towards the enrichment of some skills with more items but also to the reduction of a few items under other skills. In this direction, item generation process resulting from literature review was finalized with 14 generic items

for creativity and innovation, 11 generic items for critical thinking and problem solving, 8 generic items for collaboration, and 13 generic items for communication. Eventually, carefully reviewed and selected items brought forth the operational definitions for these skills. To depict the mindset of this research on beforementioned generic skills, operational definitions and their subdomains were as follow.

Creativity is commonly understood as the ability to produce novel and useful ideas (Plucker, Beghetto & Dow, 2004). Innovation is a term often used in a business context to refer to the successful application of creativity within an organization (Lai, Yarbro, DiCerbo & Geest, 2018). On the other hand, according to Guilford (1973) who is a doyen in the field and the owner of the most cited and acknowledge studies in literature (Lai, Yarbro, DiCerbo & Geest, 2018), creative thinking as a subclass of general thinking is composed of both convergent and divergent thinking. While convergent thinking is aimed toward a single correct answer, divergent thinking is inquiring, searching around, often leading to unconventional and unexpected answers. In that sense, for this study, while creativity or creative potential is examined under ***divergent thinking***, innovation is considered related to ***convergent thinking***.

Critical thinking is a set of skills that can be defined in a general way and that have broad applicability across multiple disciplines, but which rely on subject-specific knowledge, conventions, and tools – intrinsic to a particular domain and discipline – for their expression (Ventura, Lai & DiCerbo, 2017). For that sense, critical thinking is using a set of skills that involves systems analysis, argument analysis, creation, and evaluation. While systems analysis refers to identifying and determining the relationships between variables to understand a system, argument analysis corresponds to drawing logical conclusions based on data or claims. Moreover, while the domain of creation pinpoints creation of a strategy, theory, method, or argument based on a synthesis of evidence, and the artefact that is going beyond the information at hand, the evaluation domain involves judgement of the quality of procedures or solutions and involving criticism or a work product using a set of standards or specific framework.

Collaboration, or teamwork, is the process of interacting and requires individuals to work together toward a common goal (Lai, DiCerbo & Foltz, 2017). Furthermore, Stevens and Campion (2004) emphasize that collaboration is a multifaceted skill that is composed of both interpersonal skills and self-management skills. In that sense, while interpersonal skills include conflict resolution, collaborative problem-solving, and communication, self-management skills cover goal-setting and performance management, and planning and task coordination.

Communication is viewed as a social process in which information is exchanged to establish shared meaning and to achieve desired outcomes. Communication is identified as a set of broadly applicable and domain-general skills to effectively produce and receive messages (Metusalem, Belenky & DiCerbo, 2017). Therefore, the indicator domains under communication are *production* and *reception*.

Table 3.7

Sample Items/Indicators Formed from the Literature Review

Learning and Innovation Skills	Sample Items - Indicators
Creativity and Innovation	Using materials in novel ways
Critical Thinking and Problem Solving	Identifying variables in a system
Collaboration	Managing a group's dynamics
Communication	Keeping eye-contact while listening

3.3.1.2.4 Item Pool Generation

To generate an overarching item pool for development of an *ad-hoc* questionnaire called PLeSLIS, preliminary work on item generation including a selection of indicators revealed from the first phase of the current study and a review of the extensive literature on skills' models, indicators and theories were executed. While the latter segment of the preliminary work provided 46 generic indicators for learning and innovation skills, the former resulted in the formation of 108 indicators in total before any further consideration on whether they are generic, teaching-specific, or

assessment-related dispositions or abilities. After filtering out 91 skill indicators due to either not associating with the type 'generic-abilities' or not considered to be included based on the gathered expert opinion, the remaining 17 indicators revealed from OHILIS were decided to be included within the first version of PLeSLIS. However, the operational definitions and their related references from the literature indicated theoretical incorporation of innovation and problem solving respectively into the skills; creativity and critical thinking. Regarding the contextual inclusion and distributions of skill indicators accordingly, the first version was built comprising creativity and innovation with 19 items, critical thinking and problem solving with 14 items, collaboration with 11 items, and communication with 19 items in total. To explicitly demonstrate the development process, Table 3.8 is provided.

Table 3.8

Item Distribution According to Domains in Item Pool

Domains	OHILIS	Literature Review	*n*
Creativity and Innovation	5	14	19
Critical Thinking and Problem Solving	3	11	14
Collaboration	3	8	11
Communication	6	13	19
Total	17	46	63

3.3.1.2.5 Demographic Questions

After the item pool generation with 63 generic items in total, the next step was deciding upon demographic information to collect from participants either in relation with answering the research question or with providing a better description of the sample. In that sense, three demographic questions were asked to the participants. Since the third research question is related to an investigation of a possible significant difference in the preparedness levels of preservice teachers on learning and innovation skills, two of these demographics are gender and department. The remaining one demographic

question is to describe the sample better and it was asking about their birth year to calculate their ages. Accordingly, it was decided to add 3 demographic questions to the questionnaire, PLeSLIS.

3.3.1.2.6 Structuring PLeSLIS

According to De Vaus (2013), the process of structuring a questionnaire is the next step to be carried out following the completion of all questions or items considered to be added. With 63 items in total over 4 different skills and 3 demographic questions additionally, PLeSLIS was prepared with 5 different parts. For the beginning of the questionnaire, an informative text was written to explain the aim and scope of this research, the criteria for eligibility of participation, the parts of PLeSLIS and the types of questions, the expectation from participants, and how to contact to the researcher. Following the text, the first part was allocated to the demographic questions (3 questions) on the very first page. Then, the following parts were respectively included the items for learning and innovations skills: creativity and innovation (19 items), critical thinking and problem solving (14 items), collaboration (11 items), and communication (19 items).

Due to the wording type of items, a specific response format was required. Under the circumstances, taking the research focus on consideration was helpful. Relying on the fact that this study mainly aims to assess to what extent the teacher education programs prepare their preservice teachers to possess the 21st-century learning and innovation skills, the response format was decided to be in 10-point rating scale both to avoid getting mid-point answers and to enable some variance. Yet, since the items were not created as statements, a general note "Please, honestly and objectively rate to what extent your teacher education program has equipped you with the following competencies during your university-level study." was written and added to the top of each part allocated for 4Cs. Therefore, instead of using agreement levels, the labels, aligning with the logic of the general note, were ranged from "1= Very Inadequate" to "10=Very Adequate". Furthermore, an optional open-ended question was added to the very end to allow participants a space to share their opinions or suggestions about the

research topic if they have any. Finally, PLeSLIS was prepared and designed with two different versions; one including a detailed explanation and operational definitions along with related references for expert opinion, and a student version for piloting via cognitive interviews.
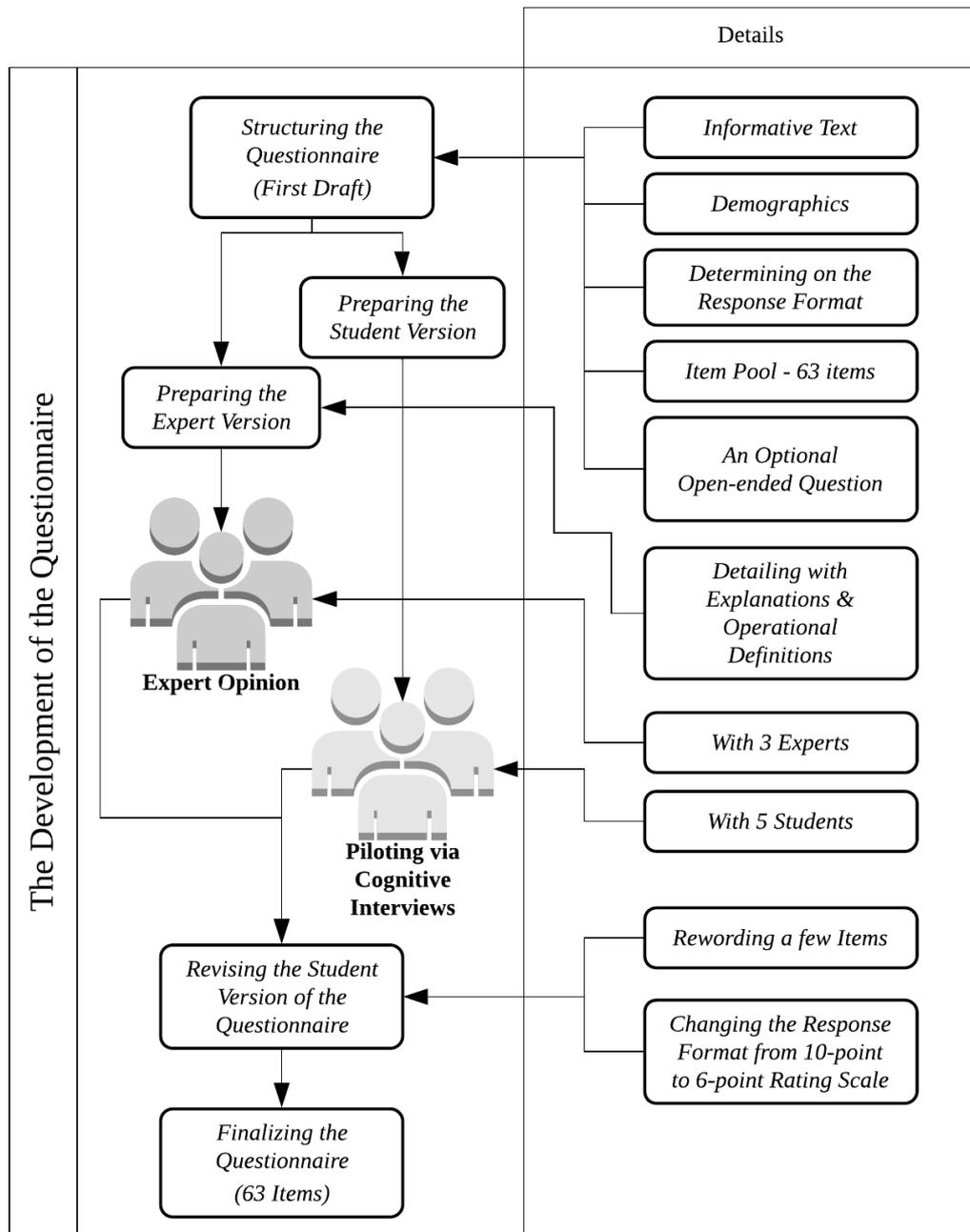
Figure 3.4 Phase II: PLeSLIS Development Process

3.3.1.2.7 Expert Opinions

After finalizing the first version, PLeSLIS exclusively prepared for an expert opinion was sent to three meritorious experts from the field of educational sciences with a specialization in teacher education. The exclusive document not only involved the whole student version but also provided the experts with specific explanations about what this study was for and an entire document for learning and innovation skills with their operational explanations, subdomains and related items under each subdomain. Examining visual, contextual, and conceptual aspects of PLeSLIS, all experts first advised making a little change in the response format from 10-point to 6-point rating type. Only two experts proposed minor rewording changes to prevent misconceptions of participants. Lastly, another agreement from the experts' side was on not removing any items for the final version after related alterations were implemented.

3.3.2 Pilot Study through Cognitive Interviews

Like consulting to experts, piloting a questionnaire including the cognitive interview technique provides evidence to establish face validity especially for newly developed questionnaires (Collingridge, 2015). Cognitive interviews can be conducted with two methods: think-aloud technique and verbal-probing (Haeger, Lambert, Kinzie, & Gieser, 2012). For this study, the former technique was employed. During the same time interval with consulting to experts, interviews with five junior students studying at the faculty of education were carried out in November 2018. The junior students were selected since the researcher did not want to diminish any possible participant from the study population.

Volunteers were called for interviews with a prepared text shared on one of the online social media groups belonging to the faculty. However, only one student conducted to the researcher, but the snowballing technique was employed with the help of the first volunteer. Thanks to the technique, while three participants (3 females) become volunteers for interviews from the Department of Elementary Science Education, the remaining two (1 female, 1 male) were from the Department of Computer Education

and Instructional Technology. The researcher separately interviewed the participants and informed them about the study, and the think-aloud technique. When volunteers started answering the prepared PLeSLIS, the researcher did not interrupt them at all until they completed but instead took notes for the problematic parts of PLeSLIS. After they completed, the researcher asked questions about the notes and sought in-depth explanations.

The overall findings indicated that a 10-point rating scale response format results in exhaustion on participants especially when completing a relatively long questionnaire. Another finding highlighted that although some items required more time than others to be answered, no question caused any misinterpretation or misconception. What is more, three participants were eager to learn more about not only the results of the study but also about what 21st-century skills are all about. As a consequence, related suggestions were considered to be applied in the finalization process of PLeSLIS to be submitted to the Ethical Committee.

3.3.3 Validity and Reliability of PLeSLIS

Invigorated within the positivist approach, validity and reliability are required evidence in quantitative research. While validity is designated as "the extent to which a concept is accurately measured", reliability refers to "the consistency of a measure" (Heale & Twycross, 2015, p.66). Keeping the definitions in mind, when a new quantitative data collection instrument is developed, it is necessary to carry out statistical analyses to provide those evidence and ensure they are non-objectionable. Since this study required an *ad-hoc* questionnaire, the evidence for face, content, construct validity and reliability evidence were provided within the following paragraphs.

3.3.3.1 Face and Content Validity

As previously addressed, both consulting to experts from the field of education and piloting through cognitive interviews were the processes meticulously employed

during the development process of this research. According to Bolarinwa (2015), these processes provide evidence for established face validity and content validity for the theoretical construct aiming to be measured.

3.3.3.2 Construct Validity

Construct validity is another validity evidence required for such a questionnaire to ensure its measurement of the topic as it is developed. In other words, De Vaus (2013) highlights this type of validity as an evaluation of "a measure by how well the measure conforms with theoretical expectations" using the empirical data collected (p. 54). To provide such a validity indication, a statistical method called factorial analysis was utilized.

As a favourable statistical analysis mostly handled in Psychology and Education, the factorial analysis is actually employed within three main intentions; accumulation of all observed variables into a smaller meaningful set, construction or clarification of a theory, and construction of validity evidence especially for self-reporting questionnaires (Williams, Onsman, & Brown, 2010). Therefore, in this study, after administering PLeSLIS ($n=205$), each four-main part was examined through a factorial analysis in IBM SPSS METU Version 20 statistical analysis software to check the alignment of the revealed latent variable structure with the ones proposed under the operational definitions of skills. Excluding the demographic part, the main parts involving creativity and innovation, critical thinking and problem solving, collaboration, and communication were included in the analysis.

To provide construct validity evidence, according to Williams, Onsman and Brown (2012), there are five steps in an exploratory factor analysis. They are;

1. Checking the appropriateness of sample size and data for any factorial analysis
2. Choosing the right method for extraction of factors
3. Determining on the factor extraction criteria
4. Deciding upon the appropriate rotational method

5. Describing and interpreting the results

3.3.3.2.1 Appropriateness of Sample Size and Data for Any Factorial Analysis

First one is to check sample size. In this analysis, there were 205 participants overall. Any participant size greater than 200 and less than 300 is considered as fair in the guideline proposed by Comrey and Lee (2013). Having said that, just judging the appropriate sample size by looking only at the number of participants is not the only evaluation.

The next value to evaluate is the ratio of participants to an item (N:p ratio). In the related literature, there are various suggestions for the ratio, but most prominent minimums are either 10:1 (Gorsuch, 1983; Hair et al., 2010) or 5:1 (Hatcher, 1994). Yet, since the total number of valid participants was 205 and the part in PLeSLIS with the maximum number of items was equal to 19, the participant-to-item ratio was calculated as 10.79:1. The calculated ratios were slightly greater than 10:1 as Gorsuch (1983) and Hair et al. (2010) proposed as a minimum, which provided a valid proof to continue with checking the correlation matrix.

When the correlation matrixes of items were checked for all four parts according to the criteria of greater than .30 proposed by Tabachnick and Fidell (2007), there were found no violation of the suggested criteria, which means none of the correlation in the matrixes of items was less than .30. These controls for all four parts proved that the data was factorable.

Following the previous controls, the Kaiser-Meyer-Olkin test of sampling adequacy and Bartlett's test of sphericity were calculated. First, the former test was conducted to understand if the sample size was enough to carry out a factorial analysis. For the interpretation of it, values closer to 1.00 indicate higher appropriateness of the sample size.

The minimum value as a criterion is considered as .50 (Williams, Onsman & Brown, 2012). On the other hand, the latter test is another test for the suitability of carrying

out a factorial analysis with the current data. And, the expected result for this test is to be significant, indicating that there exists an underlying structure in data sets. In that sense, the following tables are to show the results of the mentioned tests.

Table 3.9

KMO and Bartlett's Test for Creativity and Innovation

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.946
Bartlett's Test of Sphericity	Approx. Chi-Square	2139.566
	df	153
	Sig.	.000

According to Table 3.9, KMO value of creativity and innovation is greater than .50 and very close to 1.00, which indicates that the sample size is adequate for factor analysis. Moreover, since Bartlett's test result is estimated significant, it shows that the data set of creativity and innovation has an underlying structure.

Table 3.10

KMO and Bartlett's Test for Critical Thinking and Problem Solving

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.932
Bartlett's Test of Sphericity	Approx. Chi-Square	1399.778
	df	66
	Sig.	.000

According to Table 3.10, KMO value of critical thinking and problem solving is greater than .50 and very close to 1.00, which indicates that the sample size is adequate for factor analysis. Moreover, since Bartlett's test result is estimated significant, it shows that the data set of critical thinking and problem solving has an underlying structure.

Table 3.11

KMO and Bartlett's Test for Collaboration

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.898
Bartlett's Test of Sphericity	Approx. Chi-Square	1015.514
	df	55
	Sig.	.000

According to Table 3.11, KMO value of collaboration is greater than .50 and very close to 1.00, which indicates that the sample size is adequate for factor analysis. Moreover, since Bartlett's test result is significant, it shows that the data set of collaboration has an underlying structure.

Table 3.12

KMO and Bartlett's Test for Communication

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.918
Bartlett's Test of Sphericity	Approx. Chi-Square	1221.475
	df	66
	Sig.	.000

According to Table 3.12, KMO value of communication is greater than .50 and very close to 1.00, which indicates that the sample size is adequate for factor analysis. Moreover, since Bartlett's test result is significant, it shows that the data set of communication has an underlying structure.

In overall, all tests including Kaiser-Meyer-Olkin test of sampling adequacies and Bartlett's tests of Sphericity proved the appropriateness of sample size and data for conducting further factorial analyses. In that sense, since the appropriateness of data for factorial analysis were discussed, the following paragraphs discusses the process for selection of a method for extraction of factors.

3.3.3.2.2 Selection of a Method for Extraction of Factors

To provide construct validity, the next step is to decide upon which factor extraction method to employ. Mainly, there exist two-factor extraction methods conducted and discussed in the literature. The first one is principal component analysis or PCA. The literature highlights that PCA, unlike principal axis factoring (PAF), is used whenever a study does not provide any hypothesis about the underlying structure. Moreover, according to Thompson (2007), the results of PCA and PAF do not often indicate a significant difference. On the other hand, the latter is highly suggested over the former since the former is considered as just an item reduction method (Costello & Osborne, 2005).

Moreover, there is another commonly used extraction method, which can be preferred over PAF, Maximum Likelihood (ML). To decide between these two, scholars (Costello & Osborne, 2005; Fabrigar et al., 1999) suggest checking multivariate normality results of the data sets. For each data set in this study, both Mardia's test and the Omnibus test of multivariate normality were found significant (p<.001), indicating a violation of the multivariate normality assumption. Therefore, PAF was decided to be used as the estimation procedure since ML is not robust against the violation of the beforementioned assumption (Costello & Osborne, 2005; Fabrigar et al., 1999). In brief, the principal axis factoring (PAF) method was decided to be utilized in this study to reveal the alignment of underlined structures with the hypothesized ones as the construct validity evidence.

3.3.3.2.3 Determining the Factor Extraction Criteria

The overall aim of factor extraction is to group a large number of items into groups or related set of items, *factors*, to facilitate the interpretation of further statistical analysis on the available data (Williams, Onsman & Brown, 2012). In the literature, there is more than one criterion suggested being considered in this step of the analysis. The most acknowledged and utilized criteria are the Eigenvalues-greater-than-1 rule and the cumulative percentage of explained variance (Williams, Onsman & Brown, 2012).

For studies in social sciences, the total variance explained may be calculated as low as 50% or 60% (Hair et al., 1995) but the higher it gets, the better the structure fits. Aligning with the suggestions from the literature, this study employed these criteria to extract factors.

3.3.3.2.4 Deciding Upon the Appropriate Rotational Method

After selection of the criteria for factor extraction, a rotational technique might be applied to the results to strengthen the fitness of items onto the factors. For such treatment, there exist two distinctive rotation techniques. The first one is called orthogonal, which is employed when it is theoretically expected that the possible factors are not correlated with each other. On the contrary, the other technique is called oblique rotation, which is applied when correlation among the possible latent variables is foreseen and anticipated based on theoretical background or hypothetical structure. In that sense, the current study examined the 21st-century skills under four competencies. To clarify, creativity and innovation were operationally defined having two structures: convergent thinking and divergent thinking. Naturally, these kinds of thinking models are expected to hold a correlation between. For that reason, not only for creativity and innovation but also for the remaining three skills' hypothetical latent variables, the same logic was applied. That is, it was decided to employ an oblique rotation method for exploratory factor analyses.

3.3.3.2.5 Interpretation of the Factorial Structure Results

As mentioned before, the determined criteria for factor extraction were to check the values of total variance explained and Eigenvalues greater than 1.00. Considering these criteria, multiple iterations of exploratory factor analysis was conducted to find the best structure for each skill. During these iterations, some items were removed depending on their violations of the predefined criteria. To be more explicit, the predefined criteria for an item to be kept in the further analysis is to fulfil conditions of which it needs to load on only one factor with a minimum loading of .40 (Fornell & Larcker, 1981) and there needs to be a minimum loading difference of .15 between its

significant loading and its loadings on other factors (Tabachnick & Fidell, 2007). Moreover, while deciding upon removing an item, its reliability effect for overall reliability of each skill (*reliability if item deleted*) was also checked and consideration of minimum reliability loss was utilized in decision making. Relying on these evaluation standards, the validity and reliability evidence for each skill was discussed in the following paragraphs.

The first validity evidence was calculated for the skill designated creativity and innovation. As shown in Table 3.13, a two-factorial structure was revealed after the removal of item CI9 "An ability to produce novel ideas". The item CI9 was decided to be discarded since it loaded on two factors with less than .15 difference between loadings. With this two-factorial structure, the total variance explained was calculated as 57.18%, which is acceptable.

Table 3.13

Total Variance Explained for Creativity and Innovation

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.18	50.98	50.98	8.72	48.42	48.42
2	1.12	6.20	57.18	.71	3.92	52.34

Extraction Method: Principal Axis Factoring.

When the item loadings for creativity and innovation with two factors on Table 3.14 was examined, it seemed that 14 items under factor 1 and 4 items under factor 2 were significantly loaded. When the factors were examined, what was proposed in the operational definition of creativity and innovation had not changed. In that sense, while factor 1 was designated as convergent thinking, which is a thinking model aimed toward reaching a single answer, factor 2 was entitled as divergent thinking, which

requires inquiring, searching around, often leading to unconventional and unexpected answers.

Table 3.14

Factorial Structure of Creativity and Innovation

	Factor	
	1	2
CI12_Ability to reach conciliatory conclusions from conflicting thoughts	.81	
CI6_Ability to evaluate others' ideas	.77	
CI3_Ability to see the details of a thought	.76	
CI4_Ability to utilize contrasting ideas to achieve a certain purpose	.73	
CI19_Ability to find humour within the chaos and conflict of life	.71	
CI8_Ability to use different thinking techniques when producing ideas	.65	
CI14_Ability to see shortcomings and needs in life	.65	
CI11_Ability to think while considering different points of view	.64	
CI2_Ability to create more than one idea on a topic	.54	
CI15_Ability to visualize the final version of work or idea	.52	-.29
CI16_Ability to plan for the future	.52	
CI13_Ability to sense problems in life	.49	
CI5_Ability to self-evaluate	.47	
CI18_Ability to work with a focus	.42	
CI10_Ability to develop different approaches		-.78
CI1_Ability to use materials or objects in unorthodox ways		-.77
CI7_ Ability to create many solutions from limited resources		-.70
CI17_Ability to put ideas into practice	.31	-.57

As previously mentioned, a correlation among factors was anticipated from the theoretical grounds. In that sense, when the inter-factorial correlation matrix was

inspected, it was found as -.71. Moreover, another valid proof for the hypothesized structure was the direction of the correlation. Since convergent and divergent thinking is referring to the opposite sides of a thinking style, the direction of the correlation was found negative, which can be seen in Table 3.15.

Table 3.15

Factor Correlation Matrix of Creativity and Innovation

Factor	Convergent Thinking	Divergent Thinking
Convergent Thinking	1.00	-.71
Divergent Thinking	-.71	1.00

The second validity evidence was calculated for the skill designated critical thinking and problem-solving. In the first attempt of exploratory factor analysis for this skill, it was found that the item CP12 "An ability to understand bias in arguments" was loading on two factors with less than .15 difference between loadings. Therefore, it was decided to be discarded at the cost of losing a little value on the overall Cronbach's alpha.

However, when it was discarded, the eigenvalues were pointing towards a unidimensional structure with a considerable decrease in the total variance explained. For that reason, the analysis was forced to produce a structure with two factors. Then, when the item loadings were examined, the item CP8 "An ability to synthesize information from various arguments" loaded insignificantly on factor 2, which was cut out.

In the end, with the reduction of the item CP8 "An ability to synthesize information from various arguments", the total variance explained was found as 63.68%, which is quite acceptable. In that sense, Table 3.16 is to illustrate the total variance explained values for the factorial structure of critical thinking and problem solving.

Table 3.16

Total Variance Explained for Critical Thinking and Problem Solving

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.67	55.54	55.54	6.24	52.00	52.00
2	.98	8.14	63.68	.55	4.61	56.61

Extraction Method: Principal Axis Factoring.

When the item loadings for critical thinking and problem with two factors on Table 3.17 was examined, it seemed that 8 items under factor 1 and 4 items under factor 2 were significantly loaded. When the factors were examined, what was proposed in the operational definition of critical thinking and problem solving had not changed.

However, while the hypothesized structure included four proposed dimensions for the skill, the disclosed latent variables referred to a two-dimensional layout. In that sense, while the items under factor 1 accumulated the proposed dimensions called creation and evaluation, the items under factor 2, on the other hand, gathered the suggested dimensions called systems and argument analysis. Therefore, newly joined operational definitions for factor 1 and factor 2 are as follow:

1. Creation and evaluation pinpoint creation of a strategy, theory, method, or argument based on a synthesis of evidence, and the artefact that is going beyond the information at hand and involves not only a judgement of the quality of them but also criticism about them using a set of standards or specific framework.
2. Systems and argument analysis refer to identifying and determining the relationships between variables to understand a system and corresponds to drawing logical conclusions based on data or claims.

Table 3.17

Factorial Structure of Critical Thinking and Problem Solving

	Factor	
	1	2
CP14_ Ability to create evaluation standards with an emphasis on ethics	.81	
CP6_ Ability to find evidence that will support ideas	.81	
CP7_ Ability to create evidence-based inferences	.78	
CP11_ Ability to evaluate the applicability of proposals	.71	
CP13_ Ability to evaluate suggestions	.70	
CP9_ Ability to create arguments that will support a thought	.65	
CP1_ Ability to see the root of an incident or a problem	.65	
CP10_ Ability to formulate a strategy to reach a solution	.50	.30
CP3_ Ability to establish links between different perspectives		.88
CP2_ Ability to see the logic and point of view behind explanations		.73
CP4_ Ability to recognize variables in a system		.55
CP5_ Ability to see the basis of arguments	.26	.42

A correlation among factors of critical thinking and problem solving were also anticipated from the theoretical grounds. So, when the factor correlation matrix was inspected, as a positive correlation of .75 was found, which can be seen in Table 3.18.

Table 3.18

Factor Correlation Matrix of Critical Thinking and Problem Solving

Factor	Creation & Evaluation	Systems & Argument Analysis
Creation & Evaluation	1.00	.75
Systems & Argument Analysis	.75	1.00

The third validity evidence was calculated for the skill designated collaboration. In the very first attempt of exploratory factor analysis for this skill, the structure was perfectly revealed. None of the items was redundant or showed insignificance. For that reason, without any change, the total variance explained with a two-factorial layout (see Table 3.19) was found as 59.51%, which is acceptable.

Table 3.19

Total Variance Explained for Collaboration

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.38	48.93	48.93	4.91	44.60	44.60
2	1.16	10.59	59.51	.76	6.90	51.50

Extraction Method: Principal Axis Factoring.

When the item loadings for collaboration with two factors on Table 3.20 was examined, it seemed that 7 items under factor 1 and 4 items under factor 2 were significantly loaded. When the factors were examined, what was proposed in the operational definition of collaboration had slightly changed.

To be more explicit, while the hypothesized structure included two dimensions called interpersonal skills and self-management skills under collaboration, the disclosed latent variables were entitled as interpersonal-management and leadership. Keeping the contextual resemblance from the operational definition, the new domains were reconstructed.

In that sense, interpersonal-management included the items related to conflict resolution, goal-setting, performance management and personal planning. On the other hand, leadership covered the items related to task coordination, construction and management of group dynamics.

Table 3.20

Factorial Structure of Collaboration

	Factor	
	1	2
CL8_ Ability to supervise goal-oriented performance	.95	
CL9_ Ability to provide feedback on goal-oriented progress	.76	
CL2_ Ability to consult with others	.68	
CL7_ Ability to set a clear target for a purpose	.65	
CL6_ Ability to ask for help from others without hesitation	.63	
CL3_ Ability to apply conflict resolution methods	.53	
CL11_ Ability to create purposeful plans	.52	
CL5_ Ability to establish an open and supportive groups environment		.95
CL4_ Ability to manage the group dynamic		.59
CL1_ Ability to work in partnership with others		.54
CL10_ Ability to regulate equal task distribution		.54

As previously mentioned, a correlation among factors of collaboration was also expected from the theoretical grounds. In that sense, when the inter-factorial correlation matrix was examined, it was found as a positive correlation of .65, which can be seen in Table 3.21.

Table 3.21

Factor Correlation Matrix of Collaboration

Factor	Interpersonal-management	Leadership
Interpersonal-management	1.00	.65
Leadership	.65	1.00

Last but not least, the validity evidence was calculated for the skill designated communication. After several trials of EFA for communication to establish a meaningful structure, it was decided for items related to a communication channel such as written communication, verbal communication to be cut out from further analyses and checked for the structural establishment. In that sense, items CM4, CM5, CM6, CM17, CM18, and CM19 were removed and exploratory factor analysis was iterated. The meaningfully disclosed two-dimensional structure pointed out that the only item CM10 "An ability to act recognizing cultural and social differences" did not load on any dimension significantly, which resulted in its removal. In the end, with the remaining 12 items, 59.89% of the total variance in communication (see Table 3.22) was explained with a two-factorial structure.

Table 3.22

Total Variance Explained for Communication

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.11	50.92	50.92	5.65	47.10	47.10
2	1.08	8.97	59.89	.61	5.08	52.18

Extraction Method: Principal Axis Factoring.

When the item loadings for communication with two factors on Table 3.23 was examined, it seemed that 7 items under factor 1 and 5 items under factor 2 were significantly loaded. When the factors were examined, what was proposed in the operational definition of communication had moderately changed. Explicitly, while the hypothesized structure approach to the notion of communication from the dichotomy on reception and production skills, the item accumulations required more clear-cut definitions. Therefore, still staying in the framework of the dichotomy, the factors were renamed and more specified. Firstly, factor 1 was entitled as active

listening, which is proposed within the Pearson framework (Metusalem, Belenky & DiCerbo, 2017) under reception skills of communication, referring to paying attention, avoiding judgement, asking for clarifications, and clearly summarizing. Secondly, the factor 2 was designated as audience analysis, which is again suggested within the Pearson framework (Metusalem, Belenky & DiCerbo, 2017) under production skills of communication, corresponding to modelling receiver's emotions, expectations and mind, reflecting understanding, and selecting the most appropriate channel for transmission of meaning in order to create messages in a way that satisfies receiver's expectations from communication.

Table 3.23

Factorial Structure of Communication

	Factor	
	1	2
CM2_ Ability to talk while being mindful of space and time	.889	
CM16_ Ability to make eye contact while listening	.709	
CM14_ Ability to ask for details regarding complex messages	.629	
CM1_ Ability to empathize	.617	
CM15_ Ability to summarize the inferred message without bias	.522	.324
CM8_ Ability to create clear messages/answers	.487	.310
CM12_ Ability to listen without prejudice	.434	.278
CM9_ Ability to understand the mindset of the contact person		.916
CM13_ Ability to show/reflect understanding		.623
CM7_ Ability to understand the expectations of the partner in the communication process		.599
CM11_ Ability to select the most appropriate communication channel to transfer the message		.545
CM3_ Ability to understand differences in individual thoughts	.306	.475

As previously mentioned, a correlation among factors of communication was also anticipated from the theoretical grounds. In that sense, when the inter-factorial correlation matrix was examined, it was found a positive correlation of .70, which can be seen in Table 3.24.

Table 3.24

Factor Correlation Matrix of Communication

Factor	Active Listening	Audience Analysis
Active Listening	1.00	.70
Audience Analysis	.70	1.00

3.3.3.3 Internal Consistency Reliability

Table 3.25

Internal Consistency Reliability

Skills and Domains	N of Items	Cronbach Alpha (α)
Creativity and Innovation	18	.94
Divergent Thinking	4	.88
Convergent Thinking	14	.92
Critical Thinking and Problem Solving	12	.93
Systems and Argument Analysis	4	.81
Creation and Evaluation	8	.91
Collaboration	11	.89
Interpersonal Management	7	.87
Leadership	4	.78
Communication	15	.91
Active Listening	7	.89
Audience Analysis	5	.81

As for internal consistency reliability evidence, the Cronbach Alpha values for both overall skills and for their domains were calculated. Table 3.25 is to show all Cronbach Alpha values. Considering the internal consistency results, it can be said that the skills and their domains were assessed with high internal consistency.

3.4 Data Collection Procedures

This study was composed of two consecutive phases. In Phase I, after the opinionnaire, OHILIS, took its final form with implemented alterations and revisions, it was conducted with 54 participants who were studying in their third year in teacher education programs in a prestigious state university located in the north-western part of central Anatolia region of Turkey. To collect data, the researcher contacted to the instructors to get permission to visit their service courses given within the faculty of education during the last two weeks of the spring semester within 2017-2018 academic year at the previously mentioned university. Then, the researcher visited the permitted courses and collected data from preservice teachers who were volunteers to participate in the research.

For Phase II, PLeSLIS took its final form with consecutive processes on combining results from OHILIS with findings from the extensive literature review, implemented alterations and revisions, and it then prepared to be submitted for revisions of the Ethical Committee. The Committee confirmed that not only the questionnaire called PLeSLIS but the entire study does not violate any ethical rules in conducting research on human subjects. In that sense, the Human Research Ethics Committee at Middle East Technical University assigned the protocol number 2018-EGT-172 to this study for further questions and suggestions about the research.

After getting the ethical committee's permission, the next step was the data collection. Since the main interest within this study was related to a summative evaluation of teacher education programs in terms of learning and innovation skills in Phase II, the study population was narrowed down to senior students depending on the fact that experiencing almost the last courses of their own curricula entitles them as the most

valuable and trustworthy data sources when compared to the rest. After such a decision, reaching to almost all senior year students was aimed through a convenience sampling method. To achieve it, the researcher created a schedule of only the last year courses at the faculty and contacted to their instructors to ask for permission to visit the course and administer PLeSLIS during the class at the very end of the 2018-2019 fall semester.

All related instructors from each teacher education program were contacted and informed in detail about the study. However, only 17 instructors in total allowed the researcher to collect data during previously appointed course hours. Before the class, the researcher asked the number of approximate students in the class and prepared all the required documents. During the course hour, after a verbal introduction about the researcher and the current research, the researcher provided volunteered students with the informed consent forms and then PLeSLIS. Moreover, the researcher provided participants with all necessary information, highlighted that there is no "true" answer for the items in the questionnaire and emphasized the confidentiality of participation. Although the completion of PLeSLIS took fifteen minutes, only one female student did not want to continue answering the questionnaire after volunteering and informed the researcher about it. Then, her answer sheet was not included in this study.

3.5 Data Analysis Procedure

For the analysis of qualitative data mainly collected in Phase I, NVivo 12 student trial version was used. In Phase I, 54 participants answered 6 open-ended questions on the opinionnaire called OHILIS. Before the analysis, the first step after the data collection was the transmission of qualitative answers to an electronic medium. Although there were some unanswered questions, there were neither an incomprehensible nor unreadable answers given by any participant. After the transmission, an inductive content analysis was administered, and the revealed themes and items for the research question 1 were shared in the Results section of the current research. To illustrate the data analysis in a more compact way, Table 3.26 was added.

Table 3.26

Data Analysis Procedures

Research Questions	Data Type	Data Analysis
Phase I		
What indicators explain the 21st-century learning and innovation skills from the perceptions of preservice teachers in a research-university?	Qualitative	Inductive Content Analysis with NVivo 12 Student Trial
Phase II		
To what extent does the teacher education program offered in the research- university prepare future teachers to possess the 21st-century learning and innovation skills based on preservice teachers' perceptions?	Quantitative	Descriptive Statistics with IBM SPSS V20 METU Version
Are there significant differences in the extent the teacher education program prepares future teachers to possess the 21st-century learning and innovation skills in terms of gender and department?	Quantitative	Two one-way MANOVAs with IBM SPSS V20 METU Version

For the analysis of both descriptive and inferential statistics, an IBM product SPSS METU Version 20 for Windows 64-bit operating system was used. Prior to the analysis, the first step after the data collection was the transmission of participants' answers on the printed questionnaires to an electronic medium. During the data transmission, the researcher had a chance to check if there was a missing value. Even though one female student did answer only almost half of PLeSLIS and informed the researcher about not wanting to continue, the answers from the remaining 205 participants did not contain any incomprehensible, unreadable or null information.

There was just one open-ended question on the main data collection tool, and it was at the end of PLeSLIS as optional. This question was added to provide participants with some space to enable them to share their thoughts or suggestions about the topic. In overall, 23 participants shared their comments. Later, they were examined by the researcher in the electronic medium and two themes were revealed related to findings by the researcher. These findings were also shared in the Results section of the present study.

3.6 Limitations of the Study

To begin with, this research study was carried out in the faculty of education at a prestigious state research university located in the north-western part of central Anatolia region of Turkey. Therefore, it should be underlined that it indeed limits the scope and generalizability of the results.

Moreover, the data collection with PLeSLIS was carried out during the last two weeks of the fall semester in the 2018-2019 fall semester. The entire population of senior students in the institutions was reached and only volunteers participated. Voluntariness may impede their positive tendencies in their responses.

Besides, the researcher asked course instructors for permission to visit the classes in order to collect data. In some cases, the instructors did not allow the researcher to administer PLeSLIS neither during the class nor after the class hour ends. In that sense, some students, unfortunately, could not get a chance to participate in the study.

On the other hand, participants' eagerness to fill in such a long questionnaire with 63 items and an open-ended optional question at the end (excluding demographics) revealed during the data analysis process. Overall, there were 206 participants in the study. Only one student did not want to continue filling in PLeSLIS and left half of it unanswered after informing the researcher. However, when the remaining 205 questionnaires were examined, there were, surprisingly, no unanswered questions in the surveys. Moreover, the eagerness of the participants was elevated when it was

realized that 23 participants among 205 participants also filled in the optional question at the end and left their comments, suggestions and expectations from their preservice teacher education programs.

CHAPTER 4

RESULTS

In this chapter, the findings related to the study are presented. The chapter is composed of four sections. In the first section, the findings for the research question 1 is presented with relation to indicators revealed from inductive content analysis. Therefore, the emerged indicators are classified and shared. The second section includes the findings for the second research question representing descriptive statistics of each item under the latent variables of learning and innovation skills. Besides, each department's both overall and item-specific mean values for each item in PLeSLIS are analyzed. The third section presents the findings for the third research question looking for a significant difference in gender and department separately on the latent variables related to learning and innovation skills. Finally, the last section provides an overall summary of the results.

4.1 Indicators of Learning and Innovation Skills

Learning and innovation skill set from 21st-century skills is composed of four fundamental competencies: creativity and innovation, critical thinking and problem solving, collaboration, and communication.

In this study, an opinionnaire named OHILIS was prepared with 6 open-ended questions asking preservice teachers to write down at least three indicators of teachers who possess those skills. The data collection tool, OHILIS, was administered to 54 subjects studying in their 6th term (junior students) at the faculty of education during the last two weeks of the spring semester in the 2017-2018 academic year. These

students were from the departments of Computer Education and Instructional Technology (*n*=3), Elementary Mathematics Education (*n*=1), Elementary Science Education (*n*=23), and Foreign Language Education (*n*=27). The main aim of this data collection was to reveal the indicators of learning and innovation skills from the viewpoints of preservice teachers and select the related indicators to include in the item pool for questionnaire development.

Participants' responses were subjected to inductive content analysis via NVivo 12 Student Trial. From the responses on each question in OHILIS, indicators were determined and coded. After the indicator creation process was finalized, 108 indicators were formed in total. However, when these indicators were subjected to further analysis, it was realized that they were interpretable under two levels of categorization: generic vs. teaching-related and ability vs. disposition.

The first level categorization is consistent with the overall 21st-century skill framework classifications from the literature. According to Voogt and Roblin (2012), 21st-century skill frameworks have been globally accumulated under three main approaches: ICT related, teaching and assessment related, and generic. In that sense, the revealed indicators were contextually congruent to be classified as either generic or teaching-related for the first level classification.

For the second level classification of indicators, a semantic analysis was also required due to the multidimensional side of these fundamental 21st-century competencies. To be more explicit, these competencies in the literature are considered as multidimensional since they structurally cover not only knowledge and skills but also attitudes (OECD, 2005; Westera, 2001). Therefore, the second level classification underlined that while some of these revealed indicators refer to skill-specific dispositions such as understanding the importance of group work and team spirit, not being afraid of taking responsibilities, and supporting the novel approaches of students, others correspond to abilities representing the related skills such as an ability to see the root of an incident or problem and an ability to produce novel ideas.

The classification process is visualized in detail in Figure 4.1.
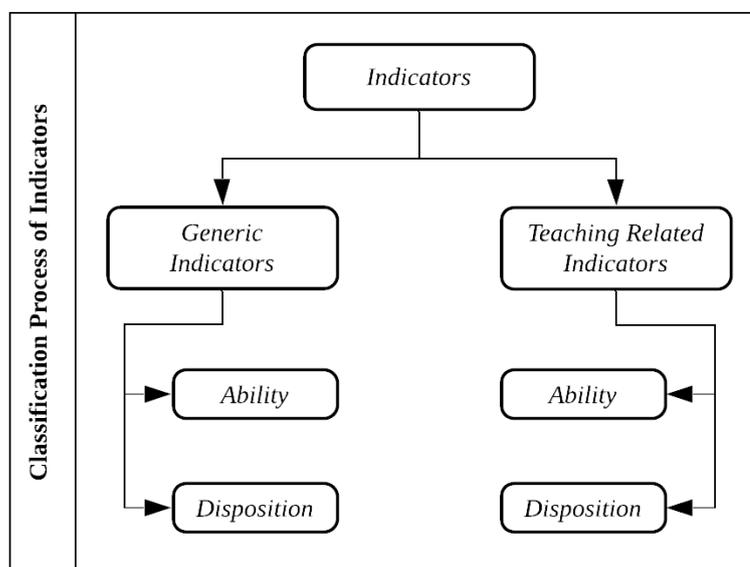
Figure 4.1 Classification Process of Indicators

Regarding these considerations, Table 4.1 displays the frequencies of indicators in each category.

Table 4.1

Frequencies of Indicators under Classifications

Classification	*f* of Disposition	*f* of Ability	Total *f*
f of Generic	30	45	75
f of Teaching-related	8	25	33
Total *f*	38	70	108

When the Table 4.1 is examined vertically, it is obvious that although the number of indicators proposed as abilities is outnumbering the other in total, the number of indicators as disposition still cannot be underrated. On the other hand, a horizontal examination shows that preservice teachers proposed more generic indicators than indicators related to teaching.

In the following paragraphs, the indicators are represented with regards to their associated skills and within their related classifications. Although the actual language of indicators revealed from the data was in Turkish, which is the researcher's native language, the given indicators were translated into English by an independent certified translator and interpreter and then checked by the researcher. In addition, starting with creativity and innovation, the flow of findings in the first section of this chapter continues with critical thinking and problem solving, collaboration, and communication.

4.1.1 Creativity and Innovation

Being highlighted as prominent educational outcomes by stakeholders in policy-making in both the previous and the current century, creativity and innovation have been among the essentially demanded skills. Although they seem to have their own particular definitions, they are contextually and mutually complementary. In that sense, creativity is mainly perceived as "an ability to produce novel and useful ideas [which] not only are original and make a unique contribution to the field but also serve some purpose or fulfil some need" (Lai et al., 2018). For the current study, indicators of creativity and innovation were asked to students separately in OHILIS. Herewith, 18 indicators revealed for creativity is shown in Table 4.2.

Table 4.2

Indicators under Classifications for Creativity

Classification		Indicators
1	2	
G	D	Preferring to use research technique in order to increase creativity
G	D	Being open to original ideas
G	Ab	Ability to utilize different points of view for novel thinking
G	Ab	Ability to produce many solutions from limited resources
G	Ab	Ability to use different thinking methods when generating ideas

Table 4.2 (continued)

Classification		Indicators
1	2	
G	Ab	Ability to produce applicable ideas
G	Ab	Ability to produce novel ideas
G	Ab	Ability to develop different approaches
G	Ab	Ability to find original answers to problems
T	D	Supporting the novel approaches of students
T	Ab	Ability to teach by using original learning activities
T	Ab	Ability to create novel learning space/class order
T	Ab	Ability to develop novel learning materials
T	Ab	Ability to use different teaching methods
T	Ab	Ability to develop novel teaching methods
T	Ab	Ability to create learning spaces that support creativity
T	Ab	Ability to develop learning activities that support creativity
T	Ab	Ability to develop original assessment and evaluation methods

Classification 1: G: Generic, T: Teaching-related

Classification 2: Ab: Ability, D: Disposition

First, all preservice teachers participated in OHILIS (*n*=54) wrote at least one indicator of an ideal creative teacher. After a comprehensive examination of the revealed indicators, it became more apparent that the overall mindset of preservice teachers on creativity was hidden in the nature of disclosed indicators. In that sense, preservice teachers' answers closely aligned with the definition of generic creativity in the literature. When the main interest for the current study was considered, the appropriate approach to collect indicators among findings was to pick indicators coded as generic-abilities for an item-pool generation. Concordant with the mentioned criterion, there were 7 indicators shown in Table 4.2. However, two of them were off topic. The first indicator "an ability to produce applicable ideas" was considered to be in relation with convergent thinking and thus innovation. The second indicator "an ability to find original answers to problems" was more associated with finding solutions to problems,

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and thus another learning and innovation skill accumulated with critical thinking; problem-solving.

On the other hand, innovation is mainly considered as successful utilization or application of a creative solution or product (Amabile & Pillemer, 2012). As previously mentioned, innovation was included as a specific question apart from creativity in OHILIS to prevent confusion. That means preservice teachers were also asked to write down at least three indicators of an innovative teacher. Herewith, 11 indicators disclosed for innovation is shown in the following Table 4.3.

Table 4.3

Indicators under Classifications for Innovation

Classification		Indicators
1	2	
G	D	Keeping up with technological innovations
G	D	Keeping up with scientific innovations
G	D	Keeping up with social developments
G	D	Being open to change and innovation
G	D	Giving importance to self-development
G	D	Using self-development opportunities (attending conferences, seminars)
T	D	Keeping up with the innovations in educational sciences
T	D	Updating educational materials and methods in accordance with innovations
T	Ab	Ability to use technology effectively in teaching
T	Ab	Ability to support the individual development of students
T	Ab	Ability to use different educational approaches

Classification 1: G: Generic, T: Teaching-related

Classification 2: Ab: Ability, D: Disposition

To begin with, almost all preservice teachers participated in OHILIS (*n*=52) wrote at least one indicator of an ideal innovative teacher even though the quality of the proposed items was questionable. Surprisingly, the data analysis signified that two preservice teachers specifically expressed that they did not know what the term innovation or innovative means.

Moreover, after a comprehensive examination of the revealed indicators, it became more apparent that overall mindset of preservice teachers on innovation was associating mainly with a perspective of self-development including the implementation of an ICT-related approach to teaching. In that sense, some of the proposed indicators were as follow: giving importance to self-development and keeping up with technological innovations. However, an exact inconsistency was found when the preservice teachers' perspectives on the term innovation and the definition of the term innovation from the literature were compared. In terms of their classifications, there was no indicator from this part that could be included in the item pool according to the criterion of which only indicators classified as generic-ability would be moved further in this research.

4.1.2 Critical Thinking and Problem Solving

Condensing into a comprehensive term over years, critical thinking is an overall ability encompassing logical thinking, argumentation, decision making and problem-solving (Butler et al., 2012; Halpern, 2003; Ventura, Lai, & DiCerbo, 2017). Vastly causing the rise of discussions among scholars in the literature and therefore resulting in the formation of various approaches, its definition still revolves around being a versatile skill which substantially employs problem-solving ability whenever vague information is solely available (Ventura, Lai, & DiCerbo, 2017).

Yet, for the current study, indicators of critical thinking and problem solving were asked to students separately in the open-ended opinionnaire named OHILIS. Herewith, 17 indicators revealed for critical thinking is shown in Table 4.4.

Table 4.4

Indicators under Classifications for Critical Thinking

Classification		Indicators
1	2	
G	D	Preferring critical thinking instead of accepting problems, ideas and solutions as they are
G	Ab	Ability to see the root of an incident or problem
G	Ab	Ability to approach incidents, ideas or problems without prejudice
G	Ab	Ability to foresee the results of ideas or plans that are proposed as solutions
G	Ab	Ability to utilize logic, analysis and evaluation in critical thinking
G	Ab	Ability to use appropriate language when transferring critical idea suggestions
G	Ab	Ability to self-evaluate
G	Ab	Ability to use more than one point of view during critical thinking
G	Ab	Ability to conduct more than one idea, point of view and/or solution during critical thinking
G	Ab	Ability to see the logic and point of view behind explanations
G	Ab	Ability to create links between different points of view
G	Ab	Ability to use advanced thinking skills
T	D	Supporting discussion environment in education
T	D	Preferring usage of various activities supporting critical thinking in education
T	Ab	Ability to execute the discussion environment in education
T	Ab	Ability to transfer the importance of critical thinking
T	Ab	Ability to create a democratic space in education

Classification 1: G: Generic, T: Teaching-related

Classification 2: Ab: Ability, D: Disposition

First, except for one participant, almost all preservice teachers participated in OHILIS (*n=53*) wrote at least one indicator of an ideal teacher who possesses a good level of critical thinking. Yet, one participant clearly stated that he/she did not know what the term critical thinking means. On the contrary, another participant provided a poetic definition for teachers who are critical thinkers as "they are the teachers who can judge both sides of the medallion and who can grind what is unseen within their thoughts".

After a comprehensive examination of the revealed indicators, it became more apparent that the generic indicators outnumbered the proposed teaching-related indicators. Furthermore, preservice teachers' answers closely aligned with the definition of generic critical thinking from the literature because the indicators mainly referred to logical thinking, argument creation and analysis, and decision-making and problem-solving.

On the other hand, generic problem solving refers to "a situation, quantitative or otherwise, that confronts an individual or group of individuals, that requires resolution, and for which the individual sees no apparent or obvious means or path to obtaining a solution" (Krulik & Rudnik, 1980, p. 3; as cited in Carson, 2007, p. 7). Although problem-solving contextually could not distinguish from critical thinking, it was asked to students separately not just to avoid possible confusion but also to enrich indicators for critical thinking. Herewith, 20 indicators revealed for problem-solving is shown in Table 4.5.

Table 4.5

Indicators under Classifications for Problem-Solving

Classification		Indicators
1	2	
G	D	Staying calm during problem-solving processes
G	D	Preferring to act in accordance with the needs of the solution
G	D	Asking for help during the problem-solving process

Table 4.5 (continued)

Classification		Indicators
1	2	
G	D	Having a solution-oriented approach
G	D	Being compatible
G	D	Not giving up when faced with a problem
G	D	Being cautious
G	D	Being planned
G	Ab	Ability to make quick decisions
G	Ab	Ability to analyse the problem
G	Ab	Ability to find applicable solutions
G	Ab	Ability to find solutions for all kinds of problems
G	Ab	Ability to turn problems into learning opportunities
G	Ab	Ability to think practically
G	Ab	Ability to find solutions to problems easily
G	Ab	Ability to find more than one solution to problems
G	Ab	Ability to identify the problem in detail
T	Ab	Ability to teach problem-solving methods
T	Ab	Ability to manage learning during problem-solving processes
T	Ab	Ability to overcome cultural differences in education

Classification 1: G: Generic, T: Teaching-related

Classification 2: Ab: Ability, D: Disposition

Unlike in critical thinking, all preservice teachers participated in OHILIS ($n=54$) answered with at least one indicator of a teacher who possesses a good level of problem-solving skill. The findings highlighted that having problem-solving specific dispositions was envisioned by preservice teachers as much as abilities for the skill. Moreover, even though there exist some abilities for problem-solving skill, they do not match with the systematic definition of the skill. The revealed abilities only cover how to act in a situation requiring problem-solving.

After a comprehensive examination of the revealed indicators for both critical thinking and problem solving, it is revealed that while critical thinking holds more systematic abilities to be utilized, problem-solving indicators mostly referred to dispositions a teacher might equip when encountered with a problem. For that reason, only three indicators respectively; "An ability to see the root of an incident or problem", "An ability to see the logic and point of view behind explanations", "An ability to create links between different points of view" from critical thinking were considered to be included in the item pool due to their alignment with the systematic definition of critical thinking also encompassing problem-solving proposed in Pearson's generic critical thinking model (Ventura, Lai, & DiCerbo, 2017).

4.1.3 Collaboration

Associated with scholastic achievement (Druskat & Kayes, 2000; Lai, DiCerbo & Foltz, 2017), with learning and working as and in a group (therefore with adaptability and coordination) (Druskat & Kayes, 2000; McClough & Rogelberg, 2003; Prichard, Stratford & Bizo, 2006), and even with civic competence and democracy in terms of a mode of living together (Althof & Berkowitz, 2006), collaboration, another skill in 4Cs, is mainly identified as an ability to interact with individuals in order to work together toward a common goal (Lai, DiCerbo & Foltz, 2017). For the current study, indicators of collaborative teachers were another question asked to students in OHILIS. Herewith, 16 indicators revealed for collaboration is shown in Table 4.6.

Table 4.6

Indicators under Classifications for Collaboration

Classification		Indicators
1	2	
G	D	Understanding the importance of group work and team spirit
G	D	Preferring collaboration to individual working
G	D	Being collectivist

Table 4.6 (continued)

Classification		Indicators
1	2	
G	D	Adopting helping with no profit
G	D	Respecting the views and ideas of others
G	D	Being open-minded and having a wide perspective
G	D	Being responsible
G	Ab	Ability to work in collaboration with others
G	Ab	Ability to consult the ideas and points of view of others
G	Ab	Ability to ask for help from others without hesitation
G	Ab	Ability to act with team spirit
T	D	Caring about being a good role model
T	Ab	Ability to work in collaboration with students
T	Ab	Ability to teach students to work in collaboration
T	Ab	Ability to form strong relationships with other teachers
T	Ab	Ability to form strong relationships with students

Classification 1: G: Generic, T: Teaching-related

Classification 2: Ab: Ability, D: Disposition

To begin with, except for two participants, almost all preservice teachers participated in OHILIS (n=52) wrote at least one indicator of an ideal collaborative teacher. Two participants left this part unanswered. After analysis on indicators for collaboration, it was revealed that half of the indicators refer to the dispositions one might have as a collaborative person, which is similar to the case in problem-solving. Yet, when semantically investigated, the indicators cover the overall logic in the systematic definition of collaboration from the literature.

However, when the main interest for the current study was considered, there were four generic abilities that could be included in the item pool. Although one indicator labelled as generic-ability "An ability to act with team spirit" were so general, three remaining indicators in the same categories; "An ability to work in collaboration with

others", "An ability to consult the ideas and points of view of others", and "An ability to ask for help from others without hesitation" were considered as valuable predictors of collaborative personas.

4.1.4 Communication

Communication as a skill has been an exceptionally pivotal educational outcome in each formal educational program all over the globe. Embodying various forms such as verbal or nonverbal, and linguistic or non-linguistic, communication as a skill is mainly characterized as an ability to engage in "a social process in which information is exchanged in order to establish shared meaning and to achieve desired outcomes" (Metusalem, Belenky & DiCerbo, 2017, p. 5). For the current study, indicators of teachers possessing a good level of communication skill were another question asked students in OHILIS. Herewith, 26 indicators revealed for communication is shown in Table 4.7.

Table 4.7

Indicators under Classifications for Communication

Classification		Indicators
1	2	
G	D	Adopting differences
G	D	Avoiding giving repartee
G	D	Being outgoing
G	D	Being reconciliatory
G	D	Being tolerant
G	D	Not being afraid of taking responsibilities
G	Ab	Ability to be a good listener and observer
G	Ab	Ability to be communicable and open minded
G	Ab	Ability to communicate with others
G	Ab	Ability to empathize

Table 4.7 (continued)

Classification		Indicators
1	2	
G	Ab	Ability to establish a dialogue
G	Ab	Ability to express oneself easily
G	Ab	Ability to express oneself in writing
G	Ab	Ability to express oneself using body language
G	Ab	Ability to express oneself verbally
G	Ab	Ability to speak considering space and time
G	Ab	Ability to speak without sanctions
G	Ab	Ability to transfer the feeling of confidence
G	Ab	Ability to understand differences in individual thinking
G	Ab	Ability to use rich vocabulary for effective communication
T	D	Guiding students outside of class
T	D	Preferring group work in teaching activities
T	Ab	Ability to encourage students to share ideas
T	Ab	Ability to make close communication with students
T	Ab	Ability to teach students the importance of effective communication
T	Ab	Ability to work in cooperation with students

Classification 1: G: Generic, T: Teaching-related

Classification 2: Ab: Ability, D: Disposition

To start with, all participants in OHILIS (n=54) shared at least one indicator of a teacher who possesses a good level of communication skill. This skill among others received the most diverse answers and the related question revealed 26 indicators in total. After analysis of the first classification of indicators for communication, it was revealed that most of the indicators were about generic predictors of the skill. Yet, when semantically investigated, the indicators cover the overall logic in the systematic definition of communication from the literature.

Considering the main interest for the current study, there were fourteen generic abilities that could be included in the item pool. To keep the number of items in the next part of the study at a minimum, only the indicators that can be taught through an educational program was determined. They were respectively; "An ability to empathize", "An ability to express oneself in writing", "An ability to express oneself using body language", "An ability to express oneself verbally", "An ability to speak considering the space and time", and "An ability to understand differences in individual thinking".

4.2 Preparedness levels of Preservice Teachers

The second research question in this study was interested to find out to what extent the teacher education programs in a prestigious university located in the north-western part of central Anatolia region of Turkey prepare their preservice teachers to possess the 21st-century learning and innovation skills. Even though the learning and innovation skill set is composed of four fundamental competencies: creativity and innovation, critical thinking and problem solving, collaboration, and communication, the construct validity analysis of data collection tools indicated that each skill was actually being assessed under their two sub-domains. These subdomains were as follow:

- Creativity and Innovation
    - Divergent Thinking
    - Convergent Thinking
- Critical Thinking and Problem Solving
    - Systems & Argument Analysis
    - Creation & Evaluation
- Collaboration
    - Interpersonal-management
    - Leadership
- Communication

- o Active Listening
- o Audience Analysis

In that sense, an index about items under each subdomain was first given. Then, the mean statistics of each item under each subdomain was indicated for each department separately for an examination in detail. For this examination, since the findings have shown with regards to departments could not be sorted, the lowest and highest values for each department were marked with an asterisk (*=Highest value, **=Lowest value). Moreover, while the tables for departments with a high participation rate (n>20) were given and discussed in the following parts, three departments with a low participation rate (PHED, CHED, & MHED) were separated from the further analysis. Still, the tables for these departments were given in Appendix A since they were represented respectively with 6, 7 and 8 participants.

4.2.1 Creativity and Innovation

Although creativity and innovation seem to have their own particular definitions, they are contextually and mutually complementary. In that sense, creativity is mainly perceived as "an ability to produce novel and useful ideas [which] not only are original and make a unique contribution to the field but also serve some purpose or fulfil some need" (Lai et al., 2018). Meanwhile, innovation is considered as a successful utilization or application of a creative solution or product (Amabile & Pillemer, 2012).

However, aligning with the approach of the doyen of creativity, Joy Paul Guilford, there exists an inherited and grounded understanding of those skills in terms of connected models of thinking. In that model, while divergent thinking is suggested as a valid predictor for creativity, convergent thinking is proposed as an indicator of innovation (Wright, Lewis, Skaggs, & Howell, 2011).

Embracing a similar approach and combining the notions of creativity and innovation, this study operationally defined the combination of the notions as one skill involving both convergent thinking and divergent thinking. Therefore, in the following

paragraphs, creativity and innovation were investigated as their factorial structure; therefore, as divergent thinking and convergent thinking.

4.2.1.1 Divergent Thinking

The first domain contributing to the assessment of creativity and innovation (more to the creativity part) was divergent thinking. Among 18 items, 4 items were found related to this domain. They were as follow:

Table 4.8

Index for Items under Divergent Thinking

Code	Items
CI1	Ability to use materials or objects in unorthodox ways
CI7	Ability to create many solutions from limited resources
CI10	Ability to develop different approaches
CI17	Ability to put ideas into practice

In Table 4.8, an index for items under divergent thinking is shared for referencing during the further examination. As mentioned before, overall mean values and standard deviations for each item horizontally were represented in Table 4.9 for each department vertically.

Table 4.9

Item Mean Statistics under Divergent Thinking

	CEIT (n=27)		ESE (n=38)		EME (n=37)		ECE (n=29)		FLE (n=53)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CI1	4.00	1.66	4.68	1.09	4.68	1.08	5.03	0.98	4.55*	1.26
CI7	3.96**	1.56	4.82	1.01	4.32**	1.13	4.93	0.96	4.40**	1.12
CI10	4.04	1.63	5.11*	0.92	4.86	0.92	5.10*	0.90	4.53	1.03
CI17	4.07*	1.66	4.66**	1.05	4.89*	0.88	4.90**	0.98	4.49	1.20

Table 4.9 (continued)

	CEIT (*n*=27)		ESE (*n*=38)		EME (*n*=37)		ECE (*n*=29)		FLE (*n*=53)	
	M	*SD*	*M*	*SD*	*M*	*M*	*SD*	*M*	*SD*	*M*
Total	4.02	1.63	4.82	1.02	4.69	1.00	4.99	0.95	4.49	1.15

*=Highest Value, **=Lowest Value

Note: Assessment on 6-point rating scale; 6= "Very Adequate" and 1= "Very Inadequate"

When descriptive statistics shown in Table 4.9 is examined, while preparedness level of preservice teachers in CEIT (*M*=4.02, *SD*=1.63) is the lowest on divergent thinking among other departments with high participation rate, the highest preparation level on the same thinking model belongs to ECE (*M*=4.99, *SD*=.95).

An in-depth examination, on the other hand, shows each department's most adequate and inadequate equipment of generic-abilities on divergent thinking from preservice teachers' perspectives. In that sense, while CEIT (*M*=3.96, *SD*=1.56) and EME (*M*=4.32, *SD*=1.13) lack the most at transferring an ability to create many solutions from limited resources, the departments, CEIT (*M*=4.07, *SD*=1.66) and EME (*M*=4.89, *SD*=.88), are good at equipping their preservice teachers with an ability to put ideas into practice. Unlike CEIT and EME, the departments ESE (*M*=4.66, *SD*=1.05) and ECE (*M*=4.90, *SD*=.98) lack the most at transferring an ability to put ideas into practice.

However, the departments ESE (*M*=5.11, *SD*=.92) and ECE (*M*=5.10, *SD*=.90) are good at equipping their prospective teachers with an ability to develop different approaches. For FLE, while the department lack most at transferring an ability to create many solutions from limited resources (*M*=4.40, *SD*=1.12), it is mostly good at, unlike others, equipping its prospective teachers with an ability to use materials or objects in unorthodox ways (*M*=4.55, *SD*=1.26).

While the items for divergent thinking (or theoretically creativity) were examined for each department in the paragraphs above, the other domain representing creativity and innovation was convergent thinking (or theoretically innovation).

4.2.1.2 Convergent Thinking

The second domain contributing to the assessment of creativity and innovation (more to the innovation part) was convergent thinking. Among 18 items of creativity and innovation, 14 items were found contributing to the assessment of this domain. For further reference while examining the estimated mean values and standard deviations on the matrix of item-department, the items accumulated under convergent thinking (or more systematically innovation) in the factorial structure are given in Table 4.10.

Table 4.10

Index for Items under Convergent Thinking

Code	Items
CI2	Ability to create more than one idea on a topic
CI3	Ability to see the details of a thought
CI4	Ability to utilize contrasting ideas to achieve a certain purpose
CI5	Ability to self-evaluate
CI6	Ability to evaluate others' ideas
CI8	Ability to use different thinking techniques when producing ideas
CI11	Ability to think while considering different points of view
CI12	Ability to reach conciliatory conclusions from conflicting thoughts
CI13	Ability to sense problems in life
CI14	Ability to see shortcomings and needs in life
CI15	Ability to visualize the final version of work or idea
CI16	Ability to plan for the future
CI18	Ability to work with a focus
CI19	Ability to find humour within the chaos and conflict of life

In Table 4.10, an index for items under convergent thinking is shared for referencing during the further examination. As mentioned before, overall mean values and

standard deviations for each item horizontally were represented in Table 4.11 for each department vertically.

Table 4.11

Item Mean Statistics under Convergent Thinking

	CEIT (*n*=27)		ESE (*n*=38)		EME (*n*=37)		ECE (*n*=29)		FLE (*n*=53)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CI2	4.56*	1.19	4.97	0.79	5.16	0.83	4.93	0.65	5.06*	0.79
CI3	4.26	1.32	4.68	1.02	4.73	0.87	4.79	1.05	4.74	0.92
CI4	4.00	1.33	4.74	0.95	4.57	0.99	4.62	1.18	4.47	1.14
CI5	4.44	1.22	5.00	0.81	4.81	0.88	5.14*	0.83	4.96	0.83
CI6	4.52	1.09	5.29*	0.73	5.22	0.79	5.10	0.77	4.92	0.85
CI8	3.93	1.47	4.82	0.90	4.95	0.81	4.79	0.98	4.51	0.99
CI11	4.41	1.15	5.18	0.73	5.24*	0.68	5.03	0.94	4.92	0.85
CI12	4.48	1.05	4.79	1.02	4.78	1.00	4.69	1.20	4.55	0.91
CI13	3.96	1.65	4.87	0.96	4.81	0.94	4.90	1.08	4.81	1.02
CI14	4.37	1.42	5.00	0.99	4.95	0.88	4.93	0.75	4.94	1.03
CI15	4.30	1.41	4.92	0.91	5.03	0.76	4.86	0.92	4.68	1.11
CI16	3.96	1.70	4.76	1.36	4.76	1.01	4.69	1.31	4.51	1.22
CI18	3.78**	1.60	4.47**	1.13	4.11**	1.07	4.34**	1.29	4.08**	1.24
CI19	4.37	1.69	5.00	1.19	4.41	1.36	4.62	1.35	4.45	1.42
Total	4.24	1.38	4.89	0.96	4.82	0.92	4.82	1.02	4.69	1.02

*=Highest Value, **=Lowest Value

Note: Assessment on 6-point rating scale; 6= "Very Adequate" and 1= "Very Inadequate"

When descriptive statistics shown in Table 4.11 is examined, while preparedness level of preservice teachers in CEIT (*M*=4.24, *SD*=1.38) is the lowest on convergent thinking among other departments with high participation rate, the highest preparation level on the same thinking model belongs to ESE (*M*=4.89, *SD*=.96). An in-depth examination, on the other hand, shows each department's most adequate and

inadequate equipment of generic-abilities on convergent thinking from preservice teachers' perspectives. In that sense, all departments surprisingly lack the most at transferring one specific ability to their preservice teachers: an ability to work with a focus. On the other hand, the departments, CEIT (*M*=4.56, *SD*=1.19) and FLE (*M*=5.06, *SD*=.79), are mostly good at equipping their preservice teachers with an ability to create more than one idea on a topic. Moreover, while ESE is mostly good at equipping their prospective teachers with an ability to evaluate others' ideas (*M*=5.29, *SD*=0.73), EME is mostly good at transferring an ability to think while considering different points of view (*M*=5.24, *SD*=0.68). For ECE, the department is mostly good at transferring an ability to self-evaluate (*M*=5.14, *SD*=0.83).

4.2.2 Critical Thinking and Problem-Solving

Condensing into a comprehensive term over years, critical thinking is an overall ability encompassing logical thinking, argumentation, decision making and problem-solving (Butler et al., 2012; Halpern, 2003; Ventura, Lai, & DiCerbo, 2017). Vastly causing the rise of discussions among scholars in the literature and therefore resulting in the formation of various approach, its definition still revolves around being a versatile skill which substantially employs problem-solving ability whenever vague information is solely available (Ventura, Lai, & DiCerbo, 2017). Mainly, critical thinking is considered as a set of skills that have broad applicability across multiple disciplines, but which rely on subject-specific knowledge, conventions, and tools – intrinsic to a particular domain and discipline – for their expression (Ventura, Lai & DiCerbo, 2017). For that sense, critical thinking is using a set of skills that involves;

1. Systems and Argument analysis refer to identifying and determining the relationships between variables to understand a system and corresponds to drawing logical conclusions based on data or claims.
2. Creation and Evaluation pinpoint creation of a strategy, theory, method, or argument based on a synthesis of evidence, and the artefact that is going beyond the information at hand and involves not only a judgement of the

quality of them but also criticism about them using a set of standards or specific framework.

4.2.2.1 Systems and Argument Analysis

The first domain contributing to the assessment of critical thinking and problem solving was systems and argument analysis. Among 12 items of critical thinking and problem-solving, 4 items were found contributing to the assessment of this domain. In that sense, the items accumulated under systems and argument analysis in the factorial structure are given in Table 4.12.

Table 4.12

Index for Items under Systems and Argument Analysis

Code	Items
CP2	Ability to see the logic and point of view behind explanations
CP3	Ability to establish links between different perspectives
CP4	Ability to recognize variables in a system
CP5	Ability to see the basis of arguments

In Table 4.12, an index for items under systems and argument analysis is shared for referencing during the further examination. As mentioned before, overall mean values and standard deviations for each item horizontally were represented in Table 4.13 for each department vertically.

Table 4.13

Item Mean Statistics under Systems and Argument Analysis

	CEIT (*n*=27)		ESE (*n*=38)		EME (*n*=37)		ECE (*n*=29)		FLE (*n*=53)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CP2	4.33*	1.33	5.13*	0.70	5.14*	0.75	4.86	1.13	4.89	0.85
CP3	4.26**	1.35	4.92	0.85	5.08	0.76	5.00*	1.10	4.92*	1.07

Table 4.13 (continued)

	CEIT (*n*=27)		ESE (*n*=38)		EME (*n*=37)		ECE (*n*=29)		FLE (*n*=53)	
	M	*SD*	*M*	*SD*	*M*	*M*	*SD*	*M*	*SD*	*M*
CP4	4.30	1.30	4.84	0.95	4.65**	0.82	4.69	0.71	4.64**	0.90
CP5	4.26**	0.98	4.82**	0.90	4.68	0.88	4.34**	1.14	4.68	0.73
Total	4.29	1.24	4.93	0.85	4.89	0.80	4.72	1.02	4.78	0.89

*=Highest Value, **=Lowest Value

Note: Assessment on 6-point rating scale; 6= "Very Adequate" and 1= "Very Inadequate"

When descriptive statistics shown in Table 4.13 is examined, while preparedness level of preservice teachers in CEIT (*M*=4.29, *SD*=1.24) is the lowest on systems and argument analysis among other departments with high participation rate, the highest preparation level on the same domain of critical thinking and problem solving belongs to ESE (*M*=4.93, *SD*=.85). An in-depth examination, on the other hand, shows each department's most adequate and inadequate equipment of generic-abilities on systems and argument analysis from preservice teachers' perspectives.

In that sense, while CEIT lacks the most at transferring both an ability to establish links between different perspectives (*M*=4.26, *SD*=1.35) and an ability to see the basis of arguments (*M*=4.26, *SD*=.98), the department is mostly good at equipping its preservice teachers with an ability to see the logic and point of view behind explanations (*M*=4.33, *SD*=1.33). For ESE, the department lacks the most at transferring an ability to see the basis of arguments (*M*=4.82, *SD*=.90), it is mostly good at equipping their preservice teachers with an ability to see the logic and point of view behind explanations (*M*=5.13, *SD*=.70). Unlike CEIT and ESE, the department EME lacks the most at transferring an ability to recognize variables in a system (*M*=4.65, *SD*=.82). However, the same department, like CEIT and ESE, is mostly good at equipping their prospective teachers with an ability to see the logic and point of view behind explanations (*M*=5.14, *SD*=.75). When the remaining departments are examined, ECE (*M*=5.00, *SD*=1.10) and FLE (*M*=4.92, *SD*=1.07) are mostly good at transferring an ability to establish links between different perspectives. Yet, they lack

on different generic abilities on systems and argument analysis. While ECE lacks the most at transferring an ability to see the basis of arguments (M=4.34, SD=1.14), FLE lacks the most at equipping its prospective teachers with an ability to recognize variables in a system (M=4.64, SD=.90).

4.2.2.2 Creation and Evaluation

The second domain contributing to the assessment of critical thinking and problem-solving was creation and evaluation. Among 12 items of creativity and innovation, 8 items were found contributing to the assessment of this domain. For further reference while examining the estimated mean values and standard deviations on the matrix of item-department, the items accumulated under creation and evaluation in the factorial structure are given in Table 4.14.

Table 4.14

Index for Items under Creation and Evaluation

Code	Items
CP1	Ability to see the root of an incident or a problem
CP6	Ability to find evidence that will support ideas
CP7	Ability to create evidence-based inferences
CP9	Ability to create arguments that will support a thought
CP10	Ability to formulate a strategy to reach a solution
CP11	Ability to evaluate the applicability of proposals
CP13	Ability to evaluate suggestions
CP14	Ability to create evaluation standards with an emphasis on ethics

In Table 4.14, an index for items under systems and argument analysis is shared for referencing during the further examination. As mentioned before, overall mean values and standard deviations for each item horizontally were represented in Table 4.15 for each department vertically.

Table 4.15

Item Mean Statistics under Creation and Evaluation

	CEIT (*n*=27)		ESE (*n*=38)		EME (*n*=37)		ECE (*n*=29)		FLE (*n*=53)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CP1	4.41*	1.39	4.92	0.85	5.03	0.76	5.00	0.89	4.74	0.98
CP6	4.26	1.35	5.00	0.81	4.73**	1.04	4.86	0.92	4.94*	0.84
CP7	4.26	1.53	5.26*	0.69	4.84	1.01	4.79	0.82	4.79	0.95
CP9	4.37	1.31	5.24	0.63	4.76	0.89	4.76	0.91	4.85	0.82
CP10	4.11	1.80	4.87**	0.78	5.16	0.73	4.86	1.09	4.62**	1.18
CP11	4.26	1.32	5.05	0.77	4.92	0.95	4.72**	1.10	4.68	0.85
CP13	4.22	1.72	5.18	0.77	5.05	1.05	5.03*	1.02	4.89	0.97
CP14	4.04**	1.76	5.26*	0.86	5.19*	0.81	4.86	1.36	4.89	1.09
Total	4.24	1.52	5.10	0.77	4.96	0.91	4.86	1.01	4.80	0.96

*=Highest Value, **=Lowest Value

Note: Assessment on 6-point rating scale; 6= "Very Adequate" and 1= "Very Inadequate"

When descriptive statistics shown in Table 4.15 is examined, while preparedness level of preservice teachers in CEIT (*M*=4.24, *SD*=1.52) is the lowest on creation and evaluation among other departments with high participation rate, the highest preparation level on the same domain of critical thinking and problem solving belongs to ESE (*M*=5.10, *SD*=.77). An in-depth examination, on the other hand, shows each department's most adequate and inadequate equipment of generic-abilities on creation and evaluation from preservice teachers' perspectives.

In that sense, while CEIT lacks the most at transferring an ability to create evaluation standards with emphasis on ethics (*M*=4.04, *SD*=1.76), the department is mostly good at equipping its preservice teachers with an ability to see the root of an incident or a problem (*M*=4.41, *SD*=1.39). For ESE, while the department lacks the most at transferring an ability to formulate a strategy to reach a solution (*M*=4.87, *SD*=.78), it is mostly good at equipping their preservice teachers with both an ability to create

evidence-based inferences (*M*=5.26, *SD*=.69) and an ability to create evaluation standards with emphasis on ethics (*M*=5.26, *SD*=.86). On the other hand, the department EME lacks the most at transferring an ability to find evidence that will support ideas (*M*=4.73, *SD*=1.04). However, the same department, like ESE, is mostly good at equipping their prospective teachers with an ability to create evaluation standards with emphasis on ethics (*M*=5.19, *SD*=.81).

While ECE lacks the most at transferring an ability to evaluate the applicability of proposals (*M*=4.72, *SD*=1.10), the department is mostly good at equipping its prospective teachers with an ability to evaluate suggestions (*M*=5.03, *SD*=1.02). Finally, while FLE lacks the most at transferring an ability to formulate a strategy to reach a solution (*M*=4.62, *SD*=1.18), the department is mostly good at equipping its prospective teachers with an ability to find evidence that will support ideas (*M*=4.94, *SD*=0.84).

4.2.3 Collaboration

Associated with scholastic achievement (Druskat & Kayes, 2000; Lai, DiCerbo & Foltz, 2017), with learning and working as and in a group (therefore with adaptability and coordination) (Druskat & Kayes, 2000; McClough & Rogelberg, 2003; Prichard, Stratford & Bizo, 2006), and even with civic competence and democracy in terms of a mode of living together (Althof & Berkowitz, 2006), collaboration, another skill in 4Cs, is mainly identified as an ability to interact with individuals in order to work together toward a common goal (Lai, DiCerbo & Foltz, 2017).

However, for that study, collaboration is defined operationally as a multifaceted skill involving interpersonal-management and leadership. Moreover, while interpersonal-management includes generic abilities related to conflict resolution, goal-setting, performance management and personal planning, leadership, on the other hand, covers the generic abilities related to task coordination, construction and management of group dynamics.

4.2.3.1 Interpersonal-Management

The first domain contributing to the assessment of collaboration was overall interpersonal-management abilities. Among 11 items of collaboration, 7 items were found contributing to the assessment of this domain. In that sense, the items accumulated under interpersonal-management in the factorial structure are given in Table 4.16.

Table 4.16

Index for Items under Interpersonal-Management

Code	Items
CL2	Ability to consult with others
CL3	Ability to apply conflict resolution methods
CL6	Ability to ask for help from others without hesitation
CL7	Ability to set a clear target for a purpose
CL8	Ability to supervise the goal-oriented performance
CL9	Ability to provide feedback on goal-oriented progress
CL11	Ability to create purposeful plans

In Table 4.16, an index for items under interpersonal-management is shared for referencing during the further examination. As mentioned before, overall mean values and standard deviations for each item horizontally were represented in Table 4.17 for each department vertically.

Table 4.17

Item Mean Statistics under Interpersonal-Management

	CEIT (*n*=27)		ESE (*n*=38)		EME (*n*=37)		ECE (*n*=29)		FLE (*n*=53)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CL2	4.15	1.41	5.05*	1.01	5.00	1.05	4.97	1.24	5.06*	0.84

Table 4.17 (continued)

	CEIT (*n*=27)		ESE (*n*=38)		EME (*n*=37)		ECE (*n*=29)		FLE (*n*=53)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CL3	4.11	1.19	4.71	0.96	4.59**	0.96	4.59	1.05	4.57**	1.07
CL6	4.04**	1.58	4.82	1.14	4.62	1.21	4.69	1.44	4.60	1.26
CL7	4.15	1.38	4.68**	0.99	4.92	1.04	4.45**	1.09	4.77	1.05
CL8	4.19	1.64	5.05*	0.87	4.97	0.80	4.86	0.83	4.83	0.87
CL9	4.33	1.36	4.82	0.87	5.03*	0.83	4.90	0.98	4.70	0.95
CL11	4.52*	1.34	5.03	0.88	4.97	0.90	5.03*	0.68	5.04	0.92
Total	4.21	1.41	4.88	0.96	4.87	0.97	4.78	1.04	4.80	0.99

*=Highest Value, **=Lowest Value

Note: Assessment on 6-point rating scale; 6= "Very Adequate" and 1= "Very Inadequate"

When descriptive statistics shown in Table 4.17 is examined, while preparedness level of preservice teachers in CEIT (*M*=4.21, *SD*=1.41) is the lowest on interpersonal management abilities among other departments with high participation rate, the highest preparation level on the same domain of collaboration belongs to ESE (*M*=4.88, *SD*=.96). An in-depth examination, on the other hand, shows each department's most adequate and inadequate equipment of generic-abilities on interpersonal management from preservice teachers' perspectives.

In that sense, while CEIT lacks the most at transferring an ability to ask for help from others without hesitation (*M*=4.04, *SD*=1.58), the department is mostly good at equipping its preservice teachers with an ability to create purposeful plans (*M*=4.52, *SD*=1.34). For ESE, while the department lacks the most at transferring an ability to set a clear target for a purpose (*M*=4.68, *SD*=.99), it is mostly good at equipping their preservice teachers with both an ability to consult with others (*M*=5.05, *SD*=1.01) and an ability to supervise goal-oriented performance (*M*=5.05, *SD*=.87). The department EME lacks the most at transferring an ability to apply conflict resolution methods (*M*=4.59, *SD*=.96). However, the same department is mostly good at equipping their

prospective teachers with an ability to provide feedback on goal-oriented progress (M=5.03, SD=.83).

Moreover, while ECE, like ESE, lacks the most at transferring an ability to set a clear target for a purpose (M=4.45, SD=1.09), the same department is, like CEIT, mostly good at equipping its prospective teachers with an ability to create purposeful plans (M=5.03, SD=.68). Finally, while FLE, like EME, lacks the most at equipping its prospective teachers with an ability to apply conflict resolution methods (M=4.57, SD=1.07), it is, similar to ESE, mostly good at transferring an ability to consult with others (M=5.06, SD=.84).

4.2.3.2 Leadership

The second domain contributing to the assessment of collaboration was leadership. Among 11 items of collaboration, 4 items were found contributing to the assessment of this domain. The generic abilities or related items of the questionnaire called PLeSLIS were as follow:

Table 4.18

Index for Items under Leadership

Code	Items
CL1	Ability to work in partnership with others
CL4	Ability to manage the group dynamic
CL5	Ability to establish an open and supportive groups environment
CL10	Ability to regulate equal task distribution

In Table 4.18, an index for items under leadership is shared for referencing during the further examination. As mentioned before, overall mean values and standard deviations for each item horizontally were represented in Table 4.19 for each department vertically.

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Table 4.19

Item Mean Statistics under Leadership

	CEIT (*n*=27)		ESE (*n*=38)		EME (*n*=37)		ECE (*n*=29)		FLE (*n*=53)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CL1	4.48	1.45	5.03*	1.00	4.73	1.45	4.97*	1.21	4.92*	1.05
CL4	4.26	1.43	4.76	1.02	4.68	1.03	4.52**	1.06	4.58	1.12
CL5	4.22**	1.25	4.66**	0.97	4.59**	0.86	4.86	0.95	4.53	0.91
CL10	4.63*	1.36	4.87	1.21	4.78*	0.95	4.55	1.40	4.40**	1.34
Total	4.40	1.37	4.83	1.05	4.70	1.07	4.72	1.16	4.61	1.10

*=Highest Value, **=Lowest Value

Note: Assessment on 6-point rating scale; 6= "Very Adequate" and 1= "Very Inadequate"

When descriptive statistics shown in Table 4.19 is examined, while preparedness level of preservice teachers in CEIT (*M*=4.40, *SD*=1.37) is the lowest on leadership abilities among other departments with high participation rate, the highest preparation level on the same domain of collaboration belongs to ESE (*M*=4.83, *SD*=1.05). An in-depth examination, on the other hand, shows each department's most adequate and inadequate equipment of generic-abilities on leadership from preservice teachers' perspectives. In that sense, while CEIT (*M*=4.22, *SD*=1.25), ESE (*M*=4.66, *SD*=.97), and EME (*M*=4.59, *SD*=.86) lack the most at transferring an ability to establish an open and supportive groups environment, only CEIT (*M*=4.63, *SD*=1.36) and EME (*M*=4.78, *SD*=.95) are mostly good at equipping their preservice teachers with an ability to regulate equal task distribution. However, ESE seems to be mostly good at transferring an ability to work in partnership with others (*M*=5.03, *SD*=1.00). On the other hand, ECE (*M*=4.97, *SD*=1.21) and FLE (*M*=4.92, *SD*=1.05), like ESE, are mostly good at transferring an ability to work in partnership with others. Finally, while ECE lacks the most at transferring an ability to manage the group dynamic (*M*=4.52, *SD*=1.06), FLE lacks the most at equipping its preservice teachers with an ability to regulate equal task distribution (*M*=4.40, *SD*=1.34).

4.2.4 Communication

Embodying various forms such as verbal or nonverbal, and linguistic or non-linguistic, communication as a skill is mainly characterized as an ability to engage in "a social process in which information is exchanged in order to establish shared meaning and to achieve desired outcomes" (Metusalem, Belenky & DiCerbo, 2017, p. 5). However, for the current study, collaboration is defined operationally as a multifaceted skill involving both:

1. Active listening, which is proposed within the Pearson framework (Metusalem, Belenky & DiCerbo, 2017) under reception skills of communication, referring to paying attention, avoiding judgement, asking for clarifications, and clearly summarizing.

2. Audience analysis, which is again suggested within the Pearson framework (Metusalem, Belenky & DiCerbo, 2017) under production skills of communication, corresponding to modelling receiver's emotions, expectations and mind, reflecting understanding, and selecting the most appropriate channel for transmission of meaning in order to create messages in a way that satisfies receiver's expectations from communication.

4.2.4.1 Active Listening

The first domain contributing to the assessment of communication was active listening. Among 12 items of communication, 7 items were found contributing to the assessment of this domain. In that sense, 7 items or generic abilities accumulated under active listening representing communication in factorial analysis are shown in Table 4.20.

Table 4.20

Index for Items under Active Listening

Code	Items
CM1	Ability to empathize

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Table 4.20 (continued)

Code	Items
CM2	Ability to talk while being mindful of space and time
CM8	Ability to create clear messages/answers
CM12	Ability to listen without prejudice
CM14	Ability to ask for details regarding complex messages
CM15	Ability to summarize the inferred message without bias
CM16	Ability to make eye contact while listening

In Table 4.20, an index for items active listening is shared for referencing during the further examination. As mentioned before, overall mean values and standard deviations for each item horizontally were represented in Table 4.21 for each department vertically.

Table 4.21

Item Mean Statistics under Active Listening

	CEIT (n=27)		ESE (n=38)		EME (n=37)		ECE (n=29)		FLE (n=53)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CM1	4.33	1.54	5.32	0.93	5.11	1.05	4.83	1.34	4.79	1.06
CM2	4.33	1.30	4.92	0.97	4.76	1.04	5.03*	1.18	4.77	0.93
CM8	4.15	1.43	4.95	0.87	4.59	0.90	4.86	1.19	4.58	1.06
CM12	4.26	1.61	4.74	1.00	4.68	0.88	4.38**	1.29	4.55	1.25
CM14	4.07**	1.59	4.71**	1.16	4.54**	1.10	4.83	1.07	4.51**	1.01
CM15	4.37*	1.39	4.95	0.87	4.86	0.98	4.62	1.12	4.91	0.95
CM16	4.15	1.63	5.37*	0.85	5.24*	0.86	5.03*	1.24	5.09*	0.97
Total	4.24	1.50	4.99	0.95	4.83	0.97	4.80	1.20	4.74	1.03

*=Highest Value, **=Lowest Value

Note: Assessment on 6-point rating scale; 6= "Very Adequate" and 1= "Very Inadequate"

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When descriptive statistics shown in Table 4.21 is examined, while preparedness level of preservice teachers in CEIT (*M*=4.24, *SD*=1.50) is the lowest on active listening abilities among other departments with high participation rate, the highest preparation level on the same domain of communication belongs to ESE (*M*=4.99, *SD*=.95).

An in-depth examination, on the other hand, shows each department's most adequate and inadequate equipment of generic-abilities on active listening from preservice teachers' perspectives. In that sense, while CEIT (*M*=4.07, *SD*=1.59), ESE (*M*=4.71, *SD*=1.16), EME (*M*=4.54, *SD*=1.10), and FLE (*M*=4.51, *SD*=1.01) lack the most at transferring an ability to ask for details regarding complex messages, ECE (*M*=4.38, *SD*=1.29) lack the most at equipping its preservice teachers with an ability to listen without prejudice.

On the other hand, while ESE (*M*=5.37, *SD*=.85), EME (*M*=5.24, *SD*=.86), ECE (*M*=5.03, *SD*=1.24), and FLE (*M*=5.09, *SD*=.97) are mostly good at transferring an ability to make eye contact while listening, CEIT is mostly good at equipping its preservice teachers with an ability to summarize the inferred message without bias (*M*=4.37, *SD*=1.39). Additionally, ECE is also mostly good at transferring an ability to talk while being mindful of space and time (*M*=5.03, *SD*=1.18).

4.2.4.2 Audience Analysis

The second domain contributing to the assessment of communication was audience analysis, which corresponds to modelling receiver's emotions, expectations and mind, reflecting understanding, and selecting the most appropriate channel for transmission of meaning in order to create messages in a way that satisfies receiver's expectations from communication. Among 12 items of communication, 5 items were found contributing to the assessment of this domain. In that sense, 5 items or generic abilities accumulated under audience analysis representing communication in the factorial analysis are shown in Table 4.22.

Table 4.22

Index for Items under Audience Analysis

Code	Items
CM3	Ability to understand differences in individual thoughts
CM7	Ability to understand the expectations of the partner in the communication process
CM9	Ability to understand the mindset of the contact person
CM11	Ability to select the most appropriate communication channel to transfer the message
CM13	Ability to show/reflect understanding

In Table 4.22, an index for items audience analysis is shared for referencing during the further examination. As mentioned before, each item for audience analysis representing communication were also examined in detail. In that sense, overall mean values and standard deviations for each item horizontally were represented in Table 4.23 for each department vertically.

Table 4.23

Item Mean Statistics under Audience Analysis

	CEIT (*n*=27)		ESE (*n*=38)		EME (*n*=37)		ECE (*n*=29)		FLE (*n*=53)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CM3	4.48	1.37	5.05*	0.84	5.11*	0.81	5.03	0.91	5.06*	0.89
CM7	4.44	1.12	4.97	0.91	4.86	0.89	5.14*	0.64	4.72	1.20
CM9	4.19**	1.33	4.76**	0.91	4.89	0.97	4.76	1.15	4.66	1.04
CM11	4.59*	1.31	4.87	0.88	4.81	1.08	4.66**	0.97	4.57**	1.17
CM13	4.41	1.31	4.84	0.97	4.62**	1.04	4.79	0.98	4.89	0.85
Total	4.42	1.29	4.90	0.90	4.86	0.95	4.88	0.93	4.78	1.03

*=Highest Value, **=Lowest Value

Note: Assessment on 6-point rating scale; 6= "Very Adequate" and 1= "Very Inadequate"

When descriptive statistics shown in Table 4.23 is examined, while preparedness level of preservice teachers in CEIT (M=4.42, SD=1.29) is the lowest on audience analysis abilities among other departments with high participation rate, the highest preparation level on the same domain of communication belongs to ESE (M=4.90, SD=.90). An in-depth examination, on the other hand, shows each department's most adequate and inadequate equipment of generic-abilities on audience analysis from preservice teachers' perspectives.

While both CEIT (M=4.19, SD=1.33) and ESE (M=4.76, SD=.91) lack the most at transferring an ability to understand the mindset of the contact person, they are good at promoting different abilities. In that sense, while CEIT is mostly good at equipping its prospective teachers with an ability to select the most appropriate communication channel to send the message (M=4.59, SD=1.31), ESE, on the other hand, is mainly good at transferring an ability to understand differences in individual thoughts (M=5.05, SD=.84). At the same time, while EME (M=5.11, SD=.81) and FLE (M=5.06, SD=.89), like ESE, are mostly good at equipping their preservice teachers with an ability to understand differences in individual thoughts, they lack the most at delivering different abilities. In detail, while EME lacks the most at transferring an ability to show/reflect understanding (M=4.62, SD=1.04), FLE, unlike CEIT, lacks the most at delivering an ability to select the most appropriate communication channel to transfer the message (M=4.57, SD=1.17). Finally, while the remaining department ECE, like FLE, lacks the most at equipping its preservice teachers with an ability to select the most appropriate communication channel to transfer the message (M=4.66, SD=.97), the department is mostly good at delivering an ability to understand the expectations of the partner in communication process (M=5.14, SD=.64).

4.2.5 Preservice Teachers' Suggestions

At the very end of the developed PLeSLIS, an optional open-ended part was provided for participants to share their suggestions and further opinions about 21st-century knowledge and skills. Among 205 participants in total, 23 of them filled in this part

even after completing such a long questionnaire with 63 items and 3 demographic questions.

Table 4.24

Frequency Table of Themes Revealed from Open-Ended Part

Classification	*f*
Acquisition of the Skills	12
Opinions	5
Needs	7
Suggestions as either 21st Century Knowledge or Skills	11
Generic Ability	3
Personality Trait	2
ICT	6
Total	23

Due to the answers' nature as being qualitative, another inductive content analysis was administered to the collected data from this part. After carrying out the mentioned qualitative analysis, two distinctive themes emerged. They were designated as the acquisition of the skills – opinions and needs, and suggestions as either 21st-century knowledge or skills. The frequency table of the revealed themes was shared in Table 4.24.

4.2.5.1 About Acquisition of the Skills – Opinions and Needs

The first theme emerged was related to the acquisition of learning and innovation skills. This theme included both opinions (*f*=5) and needs (*f*=7) specifically expressed by 12 preservice teachers.

First, the opinions included both positive and negative aspects of the acquisition of these skills. To be more explicit, one preservice teacher (Participant Number 127; thereafter PN#) from the department of ECE expressed her satisfaction of her

department's transmission of creativity by stating that one specific course on creativity given in the department helped to develop her creativity skill. On the contrary, one preservice teacher (PN 151) from the department of EME pointed a problem on the execution of conflict-resolution strategies among preservice teachers studying in the department by expressing that many groups of friends had dispersed after some instructional challenges including group work. Meanwhile, while another opinion (PN 135, ECE) was about a dissatisfaction on the existing approaches being implemented for transmission of these skills in the faculty by not specifying any further detail on the implemented approaches, the other one (PN 134, ECE) was a complaint about the extent of which the faculty members possess these learning and innovation skills. The last opinion (PN 78, ESE), unlike others, was focusing on an effect of the background of learners on the acquisition of these skills by explicitly stating that transferring these skills to learners also requires attention on learners' background covering their previous experiences and culture they live within.

Second, the preservice teachers also underlined needs on the acquisition of these skills. Specifically, the preservice teachers' answers highlighted not only a need on extra courses and a need on extracurricular activities enhancing and facilitating the acquisition of these skills but also their willingness to know more about what 21st-century knowledge and skills really are. In that sense, while two participants (PN 181, EME & PN 184, EME) explicitly underlined a need for more ICT courses to be included in teacher education curricula, one participant (PN 61, ESE) drew attention onto a need that courses in curriculum focus more on how to integrate the 21st century skills into daily life. Besides, another preservice teacher (PN 107, ECE) called the faculty for less content focus, more opportunity provided for preservice teachers to excel at these skills, another one (PN 99, ESE) explicitly stated a need for extracurricular activities such as games, drama, workshops and events designed and served within the scope of the faculty of education. Moreover, one participant (PN 33, FLE) unreluctantly and saliently remarked that s/he wants to know how to transfer these 21st-century skills to the next generation as a teacher of tomorrow. The last but not least, the other participant (PN 153, PHED) had more to say. Therefore, according

to PN 153, the more preservice teachers hear about the 21st-century learning and skills, the more they become confused about what these concepts really are, which raises more question in their mind in return. Accordingly, the PN 153 asked for a seminar explaining the topic and answering questions preservice teachers have constructed over years in teacher education, to avoid the confusion they have before starting to their careers as teachers.

4.2.5.2 Suggestions as either 21st Century Knowledge or Skills

The second theme emerged was related to content suggestions as 21st-century knowledge and skills. This theme included 11 preservice teachers' suggestions on some generic abilities which were already involved in PLeSLIS (f=3), two new personality traits of 21st-century learners (f=2), and suggestions on including ICT in these types of studies (f=6).

First, while two preservice teachers' answers (PN 65, FLE & PN 66, FLE) pointed out some already-included items in PLeSLIS such as an ability to empathize, to maintain an eye-contact, and communicate with body language, one preservice teacher (PN 60, ESE) suggested to add specifically group-work, leadership, and ICT in addition to the generic abilities taken a part in PLeSLIS. Moreover, two preservice teachers provided two different personality traits of 21st-century learners. While one participant (PN 13, EME) was suggesting that endurance should be considered since constant changes in the era require individuals to become psychologically and mentally more invulnerable to these changes, the other participant (PN 188, FLE) signalled that learners in this era become more independent and therefore more individualistic.

Also, the inclusion of ICT related abilities to these types of research was highlighted by the participants. For example, while one participant (PN 176, EME) specifically advised the inclusion of ICT domain into studies on teacher education in the 21st century, other two participants (PN 158, EME & PN 165, EME) further suggested that following technological developments would be a good indicator for ICT-related dispositions among 21st century knowledge and skills for teachers. On the other hand,

one preservice teacher (PN 191, FLE) recommended that future research could also cover how preservice teachers might benefit more from ICT in teacher education. In addition to these suggestions, while one preservice teacher (PN 64, FLE) explicitly wrote that "When the subject is 21st century and teacher education, it occurs to me that there exists an exigency of the integration of technology into education.", another participant (PN 175, EME), on the other hand, focused on the involvement of some indicators related to the teaching field proficiency.

To sum up, 23 preservice teachers shared their opinions, needs and suggestions either directly on the scopes of studies on 21st-century learning and skills or on their teacher education programs. Thanks to their participation, these results carry the utmost importance on the discussion of the overall findings from the current research.

4.3 Investigation of a Significant Difference on Preparedness Levels

The third and last research question in this study was interested to investigate if there is a significant difference in preservice teachers' preparedness levels on learning and innovation skills in terms of gender and department. In the current research, the learning and innovation skill set is composed of four fundamental competencies: creativity and innovation, critical thinking and problem solving, collaboration, and communication. However, the construct validity evidence pointed out that the preparedness level on each skill was actually being assessed under 2 domains of their own. That is, while creativity and innovation were being assessed under divergent thinking and convergent thinking, the skill of critical thinking and problem solving included two domains as systems and argument analysis, and creation and evaluation. Meanwhile, while collaboration as a skill was being assessed under two domains as interpersonal-management and leadership, communication skill included two domains called active listening and audience analysis. Therefore, the mean values of the domains on 4Cs for both gender and department were separately calculated to be compared in a proper statistical analysis with an aim to provide a grounded answer to the related research question.

Statistically speaking, there exist 2 categorical, therefore nominal, independent variables; gender with 2 levels, and departments with 8 levels, and 8 dependent variables from previously mentioned learning and innovation skills. For such an analysis, one-way multivariate analysis of variance (one-way MANOVA) was implemented separately for both gender and departments due to two main reasons. First, even before a reduction of any outliers, the female participants (n_{female}=171) have outnumbered the male participants (n_{male}=34) in the study. That means, in the university during the fall semester in the 2018-2019 academic year when data collection occurred, the number of enrolled female preservice teachers was greater than the male preservice teachers. Second, two-way MANOVA for an interaction effect of both gender and department on learning and innovation skills was not considered as a proper statistical analysis since the department ECE (n_{female}=29, n_{male}=0) in the time did not include any male preservice teachers at all. On the other hand, excluding ECE was also not an option since three departments with low participation (PHED, CHED, and MHED) was already excluded from this part of an investigation in the research and additionally excluding ECE would cost a lot of loss in the number of participants going into MANOVA. Taking these considerations in mind, two different one-way MANOVAs were conducted with overall 175 participants studying in 5 departments.

4.3.1 Assumption Checks of MANOVA

Before conducting a statistical analysis like MANOVA, there are some assumptions on data that need to be checked. These are independent observations, the absence of univariate and multivariate outliers, multivariate normality, the existence of a linear relationship between each pair of dependent variables in each level of independent variables, the absence of multicollinearity among dependent variables, and lastly homogeneity of variance-covariance matrices (Tabachnick & Fidell, 2014).

To begin with, the assumption of independent observations was met since during the entire data collection process the researcher and instructors were in the classrooms

with the participants and ensured that the participants filled the questionnaire called PLeSLIS by their own.

For checking the absence of univariate outliers, z scores for dependent variables were calculated and three cases over the absolute value of 3.29 in total were removed from the further analysis. Then, Mahalanobis Distance was calculated to see multivariate outliers lied in the data set, and the basis as the critical value was 26.13 (df=8, p=.001). The results indicated 6 cases were exceeding the critical value and signifying as a multivariate outlier. Although Mahalanobis Distance could either mark a normal value as an outlier or indicate an outlier as a normal value (Tabachnick & Fidell, 2014), the cases were removed from further analysis.

For univariate normality, analyses of statistical tests such as Kolmogorov-Smirnov and Shapiro-Wilk, and graphical plots such as histograms and Q-Q plots were conducted and examined in addition to skewness and kurtosis results. First, the values of skewness and kurtosis were between -3.00 and +3.00, highlighting the normal distribution of the data. Yet, the values of Kolmogorov-Smirnov and Shapiro-Wilk were found significant as a signal of the existence of an abnormal distribution. Therefore, further examination through graphical outputs such as histograms and Q-Q plots for each dependent variable were conducted. The graphics provided enough evidence for normal distribution in each variable. Moreover, multivariate normality analysis was also applied to the data. The multivariate normality analysis showed that Mardia's test was statistically significant ($b2p$=48.60, p<.001). Thus, the result underlined that the data violates the multivariate normality assumption. However, when each level of independent variables (sometimes called the cell size) includes more than 20 input in a situation of which the existence of unequal samples is the issue, MANOVA is robust against the violation of the multivariate normality assumption (Tabachnick, Fidell & Ullman, 2007). In this study, for both gender and department, there exist at least 20 inputs for all levels of both independent variables since not only the departments with low participation rate is excluded but also the independent variables are examined separately in two one-way MANOVAs to avoid the

abovementioned issue. Hence, despite the violation of multivariate normality, it is reasonable to continue with the one-way MANOVA.

For the existence of a linear relationship between each pair of dependent variables in each level of independent variables, the scatter plots for gender and department were separately examined, and the results indicated no violation of this assumption.

For the assumption check of multicollinearity, multicollinearity among dimensions of 4Cs was examined through three values; correlation coefficients, tolerance, and variance inflation factor or, in other words, VIF. The examination signalled no multicollinearity. First, the correlation coefficients of dependent variables did not exceed the critical value of .90 (Field, 2009) and ranged between .48 and .87. Meanwhile, while the tolerance values ranging between .12 and .48 were greater than .10, the VIF values ranging between 2.08 and 8.36 were calculated less than the critical value 10 (Hair et al., 1995). When all of them were considered, there found no violation of the multicollinearity assumption.

For the last assumption check, the homogeneity of variance-covariance matrices was inspected through Levene's test and Box's M test for both gender and department separately. While the former test was administered for the homogeneity of variance, the latter was applied to comprehend the homogeneity of covariance. In that sense, both tests were first conducted for gender and department respectively.

4.3.1.1 Gender

The results of Levene's test for gender indicated a violation of homogeneity of variance for one domain of three different learning and innovation skills: divergent thinking for creativity and innovation, creation and evaluation for critical thinking and problem solving, and interpersonal management for collaboration. Table 4.25 is given to illustrate Levene's test results of preparedness level by gender.

Following the Levene's test, Box's M test for homogeneity of covariance was examined for gender. The result (81.62, $p<.001$) indicated a violation of the

assumption for the homogeneity of covariance, revealing the existence of unequal between-group covariance matrices. However, this test is not robust against the violation of multivariate normality (Field, 2009); therefore, it might be affected by the previously mentioned violation of the related assumption. In that sense, a consideration on choosing a proper test statistic was accordingly needed and Pillai's trace was considered as a proper statistic to use since it is more robust to these sorts of assumption violations (Barbara, Tabachnick, Linda & Fidell, 2001).

Table 4.25

Levene's Test Results of Preparedness Level by Gender

Skill	Domain	*F*	*df1*	*df2*
CI	Convergent Thinking	2.25	1	173
	Divergent Thinking	12.27*	1	173
CP	Creation & Evaluation	13.26*	1	173
	Systems & Argument Analysis	2.26	1	173
CL	Interpersonal-Management	7.59*	1	173
	Leadership	2.57	1	173
CM	Active Listening	2.24	1	173
	Audience Analysis	0.56	1	173

*$p<.05$

4.3.1.2 Department

The results of Levene's test for department indicated a violation of homogeneity of variance for one domain of all four different learning and innovation skills: divergent thinking for creativity and innovation, creation and evaluation for critical thinking and problem solving, interpersonal management for collaboration, and lastly active listening for communication. Table 4.26 is given to illustrate Levene's test results of preparedness level by department.

Following the Levene's test, Box's M test for homogeneity of covariance was also conducted and examined for the department. The result (275.40, $p<.001$) indicated a violation of the assumption for the homogeneity of covariance, revealing the existence of unequal between-group covariance matrices. However, this test is not robust against the violation of multivariate normality (Field, 2009); therefore, it might be affected by the previously mentioned violation of the related multivariate normality assumption. For that reason, a consideration on choosing a proper test statistic was accordingly needed and Pillai's trace was considered as a proper statistic to use since it is more robust to these sorts of assumption violations (Barbara, Tabachnick, Linda, & Fidell, 2001).

Table 4.26

Levene's Test Results of Preparedness Level by Department

Skill	Domain	F	$df1$	$df2$
CI	Convergent Thinking	.92	4	170
	Divergent Thinking	5.23*	4	170
CP	Creation & Evaluation	4.95*	4	170
	Systems & Argument Analysis	1.27	4	170
CL	Interpersonal-Management	2.52*	4	170
	Leadership	1.16	4	170
CM	Active Listening	3.98*	4	170
	Audience Analysis	.29	4	170

*$p<.05$

4.3.2 MANOVA Results of Preparedness Level by Gender

First of all, the descriptive statistics of mean values and standard deviations calculated for preparedness level on learning and innovation skills were examined based on participants gender (See Table 4.27). In the study, after the elimination of outlier, there

remained 175 participants. Among those, there were 149 female and 26 male pre-service teachers going under one-way MANOVA.

Table 4.27

Descriptive Statistics of Preparedness Level by Gender

Skill	Domain	Female (n=149)		Male (n=26)	
		M	SD	M	SD
CI	Convergent Thinking	4.83	0.66	4.46	0.85
	Divergent Thinking	4.77**	0.84	4.18**	1.32
CP	Creation & Evaluation	4.98*	0.67	4.35	1.16
	Systems & Argument Analysis	4.82	0.67	4.47	0.99
CL	Interpersonal-Management	4.87	0.68	4.48	1.05
	Leadership	4.77**	0.80	4.50	0.92
CM	Active Listening	4.86	0.80	4.47	1.03
	Audience Analysis	4.86	0.69	4.65*	0.82

**=Lowest score, *=Highest score

When the mean values illustrated in Table 4.27 were examined for both female and male participants, it is obvious that the overall values belonging to male students for all domains in 4Cs are lower than the females' scores.

Moreover, when the lowest scores for both genders were compared, while divergent thinking (*M*=4.77, *SD*=.84) in creativity and innovation and leadership (*M*=4.77, *SD*=.80) in collaboration bottom for female preservice teachers, only divergent thinking (*M*=4.18, *SD*=1.32) in creativity and innovation was scored as the lowest for male participants. On the other hand, the highest preparedness levels underline a difference for both genders. While the males scored the highest on communication's audience analysis domain (*M*=4.65, *SD*=.82), the females indicated the highest score on creation and evaluation domain on critical thinking and problem solving (*M*=4.98, *SD*=.67).

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Table 4.28

MANOVA Results of Preparedness Levels by Gender

		Value	F	df1	df2	p	η^2
Gender	Pillai's Trace	.11	2.46*	8	166	.015	.106
	Wilks' Lambda	.89	2.46	8	166	.015	.106
	Hotelling's Trace	.12	2.46	8	166	.015	.106
	Roy's Largest Root	.12	2.46	8	166	.015	.106

*p<.05

Furthermore, since the result of Box's M test for homogeneity of covariance matrices was found significant, one-way MANOVA with Pillai's Trace was administered. The one-way MANOVA as illustrated in Table 4.28 proved that there exists a statistically significant difference in preservice teachers' preparedness level on learning and innovation skills based on their gender, F (8,166) = 2.46, $p < .05$, $\eta^2 = .11$. The effect size was considered as a medium to large effect based on Cohen's multivariate eta-squared.

Moreover, to ensure which domain on 4Cs holds a significant difference between females and males, univariate ANOVA results were required to be interpreted. Yet, to avoid an increase in Type I error or a false-positive finding, the method of Bonferroni correction needed to be applied before any further interpretation of univariate ANOVA results due to the multiple ANOVAs carried out in the same data set simultaneously to make possible of the interpretation for each dependent variable.

For such a correction, a new alpha value was determined to divide the first-set alpha value (.05) by the number of univariate ANOVAs; therefore, 8 since there were 8 dependent variables. In that sense, the new alpha value for interpretation of the results from univariate ANOVA analyses was set to .006.

Table 4.29

Univariate ANOVA Results of Preparedness Levels by Gender

Skill	Domain	df1	df2	MS	F	p	η^2
CI	Convergent Thinking	1	173	3.02	6.39	.012	.04
	Divergent Thinking	1	173	7.68	8.91*	.003	.05
CP	Creation & Evaluation	1	173	8.66	15.04*	.000	.08
	Systems & Argument Analysis	1	173	2.65	5.00	.027	.03
CL	Interpersonal-Management	1	173	3.27	5.91	.016	.03
	Leadership	1	173	1.56	2.32	.129	.01
CM	Active Listening	1	173	3.49	4.98	.027	.03
	Audience Analysis	1	173	1.04	2.06	.153	.01

*p<.006

As illustrated in Table 4.29, the results indicate that there was no statistically significant difference for both collaboration and communication in addition to CI's convergent thinking and CP's systems and argument analysis. On the other hand, there revealed a statistically significant difference based on gender not only in CI's divergent thinking, $F_{divergent\text{-}thinking}$ (1,173) = 8.91, $p < .006$, η^2 = .05 with a small to medium effect (Cohen, 1992) but also in CP's creation and evaluation, $F_{creation\text{-}evaluation}$ (1,173) = 15.04, $p < .006$, η^2 = .08 with a medium to large effect (Cohen, 1992). For further investigation on these meaningful differences, the mean values of both CI's divergent thinking and CP's creation and evaluation as illustrated in Table 4.27 were compared based on gender. Thus, it was disclosed that female preservice teachers' preparedness level on CI's divergent thinking (*M*=4.77, *SD*=.84) was significantly greater than males (*M*=4.18, *SD*=1.32). For the significant difference in CP's creation and evaluation, female participants' preparedness level (*M*=4.98, *SD*=.67) was again significantly greater than males (*M*=4.35, *SD*=1.16). To sum up, female preservice teachers studying in their last year at teacher education programs in a prestigious university located in the north-western part of central Anatolia region of Turkey

considered themselves significantly more prepared than male preservice teachers in the same university in terms of CI's divergent thinking and CP's creation & evaluation.

4.3.3 MANOVA Results of Preparedness Level on by Department

To begin with, the descriptive statistics of mean values and standard deviations calculated for preparedness level on learning and innovation skills were also examined based on participants departments (See Table 4.30). In the study, after the elimination of outlier and removing the departments with low participation (PHED; $n=6$, CHED; $n=7$, & MHED; $n=8$), there remained 175 participants over 5 departments. Among those, the departments going under one-way MANOVA were CEIT ($n=23$), ESE ($n=35$), EME ($n=37$), ECE ($n=29$), and FLE ($n=51$).

Table 4.30

Descriptive Statistics of Preparedness Level by Department

Skill	Domain	CEIT		ESE		EME		ECE		FLE	
		M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CI	CT	4.45	0.91	4.97	0.63	4.82	0.55	4.82	0.73	4.71	0.68
	DT	4.33**	1.45	4.85**	0.85	4.69**	0.75	4.99*	0.78	4.55**	0.91
CP	CE	4.51	1.28	5.16*	0.49	4.96*	0.66	4.86	0.78	4.82	0.71
	SAA	4.35	0.97	4.91	0.57	4.89	0.60	4.72**	0.86	4.79	0.69
CL	IM	4.45	1.09	4.94	0.64	4.87	0.66	4.78	0.80	4.85*	0.65
	L	4.65*	0.88	4.96	0.63	4.70	0.89	4.72**	0.93	4.62	0.80
CM	AL	4.48	1.29	5.07	0.65	4.83	0.65	4.80	1.01	4.76	0.71
	AA	4.63	0.79	4.97	0.64	4.86	0.61	4.88	0.71	4.78	0.80

CT: Convergent Thinking, DT: Divergent Thinking, CE: Creation & Evaluation, SAA: Systems & Argument Analysis, IM: Interpersonal-Management, L: Leadership, AL: Active Listening, AA: Audience Analysis

**=Lowest score, *=Highest score

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When the mean values shown in Table 4.30 were examined for each department, it is obvious that the lowest preparedness levels of all remaining departments except ECE were in the skill creativity and innovation, more specifically on the domain of divergent thinking. Unlike the rest, ECE held its own highest preparedness level score on that specific domain of creativity and innovation (M=4.99, SD=.78) but the same department scored the least on both systems and argument analysis domain of critical thinking and problem solving (M=4.72, SD=.86), and the domain of leadership of the skill collaboration (M=4.72, SD=.93). However, the departments ESE (M=5.16, SD=.49) and EME (M=4.96, SD=.66) showed similarity and scored their own highest scores on the same domain creation and evaluation of critical thinking and problem-solving. Although the remaining departments CEIT and FLE indicated a resemblance on having their own highest preparedness levels on the collaboration skill, the domains differed and while FLE's preparedness level was the highest on interpersonal-management (M=4.85, SD=.65), CEIT's highest score was on leadership (M=4.65, SD=.88) on the same skill.

Table 4.31

MANOVA Results of Preparedness Levels by Department

		Value	F	df1	df2	p	η^2
	Pillai's Trace	.26	1.45	32	664	.055	.065
	Wilks' Lambda	.76	1.45	32	603	.053	.066
Department	Hotelling's Trace	.29	1.46	32	646	.052	.067
	Roy's Largest Root	.15	3.03	8	166	.003	.127

*p<.05

To examine if there exists an interdepartmental significant difference of preparedness level on learning and innovation skills, one-way MANOVA with Pillai's Trace was administered since the result of Box's M test for homogeneity of covariance matrices on departments was found significant. The one-way MANOVA as illustrated in Table 4.31 proved that there is no statistically significant difference in preservice teachers'

preparedness level on learning and innovation skills based on their departments, F (32,664) = 1.45, $p > .05$. That is, the calculated preservice teachers' preparedness levels on learning and innovation skills did not differ depending on their departments.

4.4 Summary

In this extensive research, there were three main interests: revealing the indicators of learning and innovation skills from preservice teachers' perspectives through an inductive content analysis on the data collected by a 6-item open-ended opinionnaire named OHILIS, finding out to what extent the teacher education programs prepare their preservice teachers to possess the 21st-century learning and innovation skills by an in-depth descriptive statistical analysis on each item of the related learning and innovation skills taking part in a developed PLeSLIS, and lastly investigating if there exists a statistically significant difference in preservice teachers' preparedness levels on learning and innovation skills in terms of gender and department separately via two one-way MANOVAs.

4.4.1 Indicators of Learning and Innovation Skills

This part included Phase I's results of the present research. 54 junior preservice teachers participated in Phase I. After the data analysis, 108 indicators were revealed in total. However, when these indicators were subjected to further semantic analysis, it was realized that they were interpretable under two levels of categorization: the first level categorization as either being generic or teaching-related and the second level categorization as either being skill-specific dispositions or corresponding to abilities representing the related skills. This classification indicated that preservice teachers envision teachers of the 21st century with both abilities and dispositions for both their own personas and professions.

In the end, there were 45 generic abilities and 25 teaching-related abilities. The revealed indicators for both collaboration and communication matched with their

systematic definitions. However, the remaining skills in this part revealed the worrying results and they can be summarized as follow:

Creativity

- Under this skill, preservice teachers proposed some indicators referring to innovation and problem-solving. That means, they envisioned that a creative teacher possesses not only creativity but also innovation and problem-solving skills in order to hold a creative persona.

Innovation

- Two preservice teachers out of 54 reported that they do not know what the term "innovation" or an "innovative" teacher means.
- Indicators of an innovative teacher, from preservice teachers' perceptions, revolved around both technology integration in education and self-development instead of its lexical definition as successful application or utilization of a creative solution or product (Amabile & Pillemer, 2012).

Critical Thinking

- One preservice teacher out of 54 reported that s/he does not know what the term "critical thinking" or a "critical thinker" means.

Problem Solving

- According to preservice teachers' perceptions, dispositions and abilities related to problem-solving mostly referred to how a teacher with problem-solving skill should act in a situation requiring her/him to utilize the skill.
- Even though there exist proposed abilities for the problem-solving skill, they do not match with the systematic definition of it.

4.4.2 Extent the Teacher Education Programs Prepare Their Preservice Teachers to Possess the 21st-Century Learning and Innovation Skills

This part included Phase II's results of the present research. 205 senior preservice teachers participated in Phase II. While the results for departments with a high participation rate ($n>20$) were given in this chapter, the results of the departments with a low participation rate (PHED, CHED, & MHED) were given in Appendix A since they were represented respectively with 6, 7 and 8 participants.

Even though the learning and innovation skill set is composed of four fundamental competencies: creativity and innovation, critical thinking and problem solving, collaboration, and communication, the construct validity analysis of the data collection tool indicated that each skill was actually being assessed under their two sub-domains. These subdomains were as follow:

- Creativity and Innovation
  - Divergent Thinking (DT)
  - Convergent Thinking (CT)
- Critical Thinking and Problem Solving
  - Systems & Argument Analysis (SAA)
  - Creation & Evaluation (CE)
- Collaboration
  - Interpersonal-management (IM)
  - Leadership (L)
- Communication
  - Active Listening (AL)
  - Audience Analysis (AA)

In that sense, an analysis of descriptive statistics of each department on each domain indicated the extent the teacher education programs prepare their preservice teachers to possess those skills. Moreover, the mean statistics for departments were illustrated in Table 4.32.

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Table 4.32

Status of Departments' Preparedness Levels on Learning and Innovation Skills

Skills & Domains	CEIT	ESE	EME	ECE	FLE
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Creativity and Innovation					
DT	4.02 (1.63)	4.82 (1.02)	4.69 (1.00)	4.99 (0.95)	4.49 (1.15)
CT	4.24 (1.38)	4.89 (0.96)	4.82 (0.92)	4.82 (1.02)	4.69 (1.02)
Critical Thinking and Problem Solving					
SAA	4.29 (1.24)	4.93 (0.85)	4.89 (0.80)	4.72 (1.02)	4.78 (0.89)
CE	4.24 (1.52)	5.10 (0.77)	4.96 (0.91)	4.86 (1.01)	4.80 (0.96)
Collaboration					
IM	4.21 (1.41)	4.88 (0.96)	4.87 (0.97)	4.78 (1.04)	4.80 (0.99)
L	4.40 (1.37)	4.83 (1.05)	4.70 (1.07)	4.72 (1.16)	4.61 (1.10)
Communication					
AL	4.24 (1.50)	4.99 (0.95)	4.83 (0.97)	4.80 (1.20)	4.74 (1.03)
AA	4.42 (1.29)	4.90 (0.90)	4.86 (0.95)	4.88 (0.93)	4.78 (1.03)

Domains= DT: Divergent Thinking, CT: Convergent Thinking, SAA: Systems & Argument Analysis, CE: Creation & Evaluation, IM: Interpersonal-Management, L: Leadership, AL: Active Listening, AA: Audience Analysis

Note: Assessment on 6-point rating scale; 6= "Very Adequate" and 1= "Very Inadequate"

The results indicate that while the lowest preparedness level on the matrix belongs to the Department of Computer Education and Instructional Technology on divergent thinking (*M*=4.02, *SD*=1.63), the highest preparedness level belongs to the Department of Elementary Science Education on creation and evaluation (*M*=5.10, *SD*=.77). Moreover, while the department of CEIT holds the lowest preparedness levels on all domains of learning and innovation skills, the department of ESE, on the contrary, holds the highest preparedness levels on 7 out of 8 domains of the mentioned skill set. The exception is for the highest preparedness level on the domain called divergent thinking under creativity and innovation. To be more explicit, the highest preparedness

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level on the domain belongs to the Department of Early Childhood Education (ECE) instead of the department of ESE.

In addition to the items on a 6-point rating scale, an optional open-ended part was provided for participants to share their suggestions and further opinions about 21st-century knowledge and skills at the very end of PLeSLIS. Among 205 participants in total, 23 of them filled in this part. After the analysis of data, two distinctive themes emerged. They were designated as the acquisition of the skills and suggestions as either 21st-century knowledge or skills. For the extended version of each answer, see Appendix B.

4.4.3 Difference in Preparedness Levels on Learning and Innovation Skills

This part also included Phase II's results of the present research to investigate if there is a significant difference in preservice teachers' preparedness levels on learning and innovation skills in terms of gender and department. After assumption checks and elimination of outliers, two different one-way MANOVAs were conducted with overall 175 participants studying in 5 departments.

The results indicated that there exists a statistically significant difference in preservice teachers' preparedness level on learning and innovation skills based on their gender. Finally, it was revealed that the senior female preservice teachers considered themselves significantly more prepared than the male preservice teachers on two domains of learning and innovation skills: divergent thinking, and creation and evaluation.

Furthermore, the results indicated that there is no statistically significant difference in preservice teachers' preparedness level on learning and innovation skills based on their departments.

CHAPTER 5

CONCLUSION AND DISCUSSION

The aim of the last chapter is to critique the findings of the study with regards to the previously published studies from the literature. In addition to presenting a critical analysis of the results, the present chapter further discusses implications of findings in teacher education and presents recommendations for further research.

5.1 Introduction

The present study was a compact research involving two consecutive phases: finding out the indicators of learning and innovation skills from preservice teachers' perceptions in the first phase to develop a survey and estimating preparedness levels of preservice teachers from their perceptions on the same skills in the second phase via the developed survey. Considering that, the current study both provided a picture of the existing status of preservice teachers on learning and innovation skills in the university where the data was collected and contributed knowledge to teacher education literature. Accordingly, this study from a major perspective shed light on the current status of teacher education programs on the learning and innovation skill set in a state research university located in the north western part of central Anatolia region in Turkey.

To begin with, learning and innovation skill set in this study encompassed the well-known 4Cs; in other words, creativity and innovation, critical thinking and problem solving, collaboration, and communication. Via an open-ended opinionnaire named OHILIS, in the first phase of the study, indicators of a teacher who possesses these

skills were asked to 54 junior preservice teachers. In the second phase, preservice teachers' preparedness levels on the mentioned skill set were statistically estimated with a developed questionnaire called PLeSLIS from 205 preservice teachers' perspectives. Additionally, the calculated preparedness levels were further examined for a possible significant difference in terms of gender and department. Following this structure, the findings were discussed in the upcoming parts.

5.2 Learning and Innovation Skills

Among indicators of a creative teacher which preservice teachers proposed, two indicators "an ability to produce applicable ideas" and "an ability to find original answers to problems" were in relation with convergent thinking; thus innovation, and problem-solving respectively. The proposition of these two distinct concepts under creativity by the preservice teachers can be justified with one of the characteristics of these learning and innovation skills. To be more explicit, 21st Century competencies are generally associated with higher-order thinking abilities since coping with possible problems encountered in the era compels individuals to utilize more than one competence at the same time in the process of reacting to situations (Collins, 2014; P21, 2015; Westera, 2001). Thereof, it is probable that preservice teachers wrote down these two indicators while simultaneously linking creativity with both innovation and problem-solving in their mindsets.

When the analysis was conducted for innovation, it was found that two preservice teachers out of 54 stated that they do not know what the term "innovation" or an "innovative" teacher means. This specific result is actually consisted with findings of a recent study (Bal-İncebacak, Sarışan-Tungaç, & Yaman, 2018) which was carried out with 121 in-service teachers. Although the samples are different, the worrying results are similar. In the study of Bal-İncebacak et al. (2018), an open-ended opinionnaire was administered to 121 in-service teachers with an aim to identify perceptions of primary school teachers on novelty and innovation in education. From their study, the estimated percentage of teachers who do not know the meaning of the term innovation was 75% which corresponds to almost 91 teachers. Fortunately, that

number in this study is far below their worrying finding. Such a decrease in number might be due to improvements and changes in teacher education programs over the years. Nevertheless, it is obvious that an action needs to be taken to accurately construct the notion in teachers and it should be resolved during preservice training.

Additionally, after a semantic analysis on indicators of innovation, it was disclosed that preservice teachers' perceptions on an innovative teacher only accommodate dispositions towards self-development and abilities related to technology integration into education. These findings closely align with another study on conceptualization of the term innovative teacher. Çakmak, Budak and Kayabaşı (2018) conducted a qualitative study with 36 graduate students in educational sciences. Their study aimed to reveal characteristics of an innovative teacher from graduate students' perspectives. Their results indicated that graduate students envision innovative teachers holding characteristics such as technological, open to self-improvement, and motivated in addition to teaching related aspects like student-centered.

Even though the results from both the present study and Çakmak et al.'s (2018) study indicate similarity, it should be noted that an inconsistency appears when these results are compared with the actual meaning of the term innovation. In that sense, the term innovation systematically refers to successful utilization or application of a creative solution or product (Amabile & Pillemer, 2012). The particular mismatch, on the other hand, could be a cultural issue. That is, the term innovation might be associated with ICT integration into education and self-development from preservice teachers' perceptions since a long standing and well-known ICT policy and project in Turkish national education called FATİH have been advertised as innovation in education through Turkish media. Being exposed to such kind of advertisement over years, the preservice teachers might have naturally conceptualized the term in this way. Yet, a lack of focus either on the term itself or on the notion of innovative teacher in teacher preparation curriculum might have also caused this issue to continue and even elevate. Further research on finding out exact reasons of the issue might be helpful to deeply

understand it and could provide better implications to develop effective solutions within teacher education programs themselves.

Furthermore, critical thinking and problem solving were the parts reflecting minor nuances. First, one out of 54 junior preservice teachers one participant stated that they do not know what the term critical thinking means. This result may be considered more or less consistent with the findings of a qualitative study carried out with 70 in-service teachers. Kanik (2010) conducted the study with an aim to identify their conceptions of critical thinking through in-depth interviews with in-service teachers. According to the results, Kanik (2010) did not encounter anyone who does not know the meaning of the notion. Although in the current study there was only one participant reporting unfamiliarity with the concept, it still sounds problematic as there might be graduates of teacher education programs who lack knowledge even on the term critical thinking. In that sense, the issue needs to be further investigated in upcoming studies.

Second, it became evident that when preservice teachers were asked to write indicators of a teacher who possess the problem-solving skill, they envisioned teachers equipping both dispositions and abilities related to problem solving. However, even though there exist some abilities for the problem-solving skill, they do not match with the systematic definition of problem-solving. The abilities such as making quick decisions and thinking practically only cover how to act in a situation requiring problem-solving. Similarly, dispositions such as staying calm and being cautious referred to the same aspect of problem solving. Although these indicators do not deviate from the nature of the skill, they in fact lack a systematic approach to it. In that sense, the finding is consistent with Son and Lee's (2016) results. To be more explicit, Son and Lee (2016) carried out a qualitative research via an open-ended questionnaire with 96 preservice teachers from two universities with an aim to explore their conceptions of problem solving. Their study investigated and revealed problem solving mainly in a competency level, which means that their findings were clustered under knowledge, skill and disposition categories. Yet, while the abilities of problem solving revealed above in the present study mostly match with Son and Lee's (2016) identified abilities,

the revealed dispositions above in this study are more detailed and elaborated when compared to theirs. For instance, 8 particular dispositions related to problem-solving skill in this study were found as follow: having a solution-oriented approach, not giving up when faced a problem, being planned, and being cautious. On the other hand, Son and Lee's (2016) study only revealed 5 dispositions that reflect a more macro level such as creative, collaborative, effort-driven, open-minded and patient. Moreover, the issue, lack of a systematic approach to problem solving from preservice teachers' perceptions in this study, was completely consistent with Son and Lee's (2016) finding. Considering the findings from the current study, while a lack of a systematic approach to problem solving might be due to a lack of preservice teachers' knowledge on problem-solving methods, more detailed dispositions may result from their prior experiences in which they were supposed to utilize the skill. Further in-depth research could focus on and examine these aspects of the skill from preservice teachers' perspectives.

All in all, based on the study findings in Phase I, it might be concluded that teacher education programs need to focus more on transferring the actual meanings of the terms innovation and critical thinking, and teaching systematic approaches of problem solving. In the next part, the findings are discussed in relation to the statistical examination of preservice teachers' preparedness levels.

5.3 Preparedness Levels on Learning and Innovation Skills

After the administration of PLeSLIS instrument, 205 senior preservice teachers' preparedness levels on the learning and innovation skill set were calculated. Although the learning and innovation skill set covers 4Cs, the construct validity check of PLeSLIS revealed that each skill in 4Cs was in fact assessed under two skill-related domains. In that sense, preservice teachers' preparedness levels on each domain of each skill were determined for each department. However, since the data for the estimation of preparedness levels were not from observed measures, individuals with high expectation might have rated items differently than individuals with lower expectation. Accordingly, this could be the reason for some departments to hold low

and others to score high preparedness levels. Still, the teacher education departments holding the lowest score and highest score on a matrix of 8 domains of learning and innovation skills and 5 departments with high-participation rate (Computer Education and Instructional Technology, Early Childhood Education, Elementary Mathematics Education, Elementary Science Education, and Foreign Language Education) are discussed in the following paragraphs.

In this study, it was found that the lowest preparedness level was on the divergent thinking domain of creativity and innovation. After an examination of this score on the interdepartmental level, it was disclosed that this lowest preparedness score on divergent thinking belonged to preservice teachers from the department of Computer Education and Instructional Technology (CEIT). Even though the literature on teacher education was examined through databases such as BASE, EBSCO, ERIC, Google Scholar, SAGE Journals Online, ScienceDirect, Scopus, Semantic Scholar, SpringerLink, Taylor & Francis Online Library, Web of Science, and Wiley Online Library until April 2019, such a compact study is very rare when available studies are considered. Fortunately, the particular finding of CEIT having the lowest score on creativity among other teacher preparation programs is consistent with a study on creativity levels of preservice teachers. In that sense, Temizkalp (2010) conducted a quantitative survey study via utilizing the Torrance Creativity Test with 300 preservice teachers from 10 teacher education programs in the Turkish context. While in Temizkalp's (2010) study the department of CEIT held the lowest score on the Elaboration domain of creativity, in the present study divergent thinking is found the lowest for CEIT department. Considering that, it is important to further investigate the underlying reasons of this findings.

Moreover, from the present study findings, it can be concluded that the highest preparedness level was on the creation and evaluation domain of critical thinking and problem solving. After an examination of this score on the interdepartmental level was computed, findings showed that the highest preparedness score on creation and evaluation belonged to preservice teachers from the department of Elementary Science

Education (ESE). Fortunately, the particular finding can be considered as consistent with Erdem and Yazıcıoğlu (2015)'s results. In their study, they aimed to estimate preservice teachers' critical thinking tendencies and conducted the study with 924 preservice teachers from 11 teacher education programs. According to their results, the department of ESE scored the highest tendency towards critical thinking just after the department of Arts Education. In that sense, while Erdem and Yazıcıoğlu's (2015) particular result is consistent with the findings of the current research. Moreover, ESE holding the highest preparedness level on a domain of critical thinking and problem solving in the current study might be due to their high tendency on utilization of the skill. Yet, due to the quantitative nature of the study, the reasons cannot be identified and needs further elaboration through in-depth qualitative studies.

Furthermore, it was also found that there was a consistent pattern of which departments held the lowest and highest scores on each domain of learning and innovation skill set. That is, while the department of CEIT held the lowest preparedness levels on all domains of learning and innovation skills, the department of ESE, on the contrary, held the highest preparedness levels on 7 out of 8 domains of the mentioned skill set. The exception was for the highest preparedness level on the domain called divergent thinking under creativity and innovation since the highest preparedness level on the domain belonged to the department of Early Childhood Education (ECE) instead of the department of ESE. This particular exception is also consistent with Temizkalp (2010)'s findings. As previously mentioned, in Temizkalp (2010)'s study, the aim was to investigate preservice teachers' creativity levels. As a result, the study concluded that the highest creativity score belonged to the preservice teachers studying in the department of ECE. Considering these consistent results, the particular situation in which ECE scores higher than others on creativity could be due to a course called creativity and development given as compulsory in early childhood education curriculum in Turkey (Dere, 2017) since the course covers knowledge on the nature of creativity.

To conclude based on the study findings in Phase II, the teacher education programs indicated variances on their preservice teachers' preparedness levels. Moreover, these differences might be due to preservice teachers' backgrounds as one of the participants (Participant Number 78, ESE, See Appendix B) reminded that in the open-ended part of PLeSLIS. However, and more crucially, a pattern was disclosed according to the results of the present study. While CEIT consistently held the lowest preparedness levels on all learning and innovation skills, ESE dominantly scored the highest almost all domains of the skills (7 out of 8). Since this study holds a quantitative nature, reasons of such a pattern of these departments should be further examined in a qualitative study. In the following part, the findings are discussed in relation to between-gender and interdepartmental difference on preservice teachers' preparedness levels.

5.4 Differences on Preparedness Levels

In the present study, a possible significant difference on preservice teachers' preparedness levels in terms of gender and department was also investigated. For the specific statistical examination, two one-way MANOVAs were utilized after the elimination of outliers and the check of other assumptions for running a MANOVA test were completed. For gender, the results revealed that statistically significant differences were found in preparedness levels of preservice teachers on two domains of learning and innovation skill set. On the other hand, it was found that there was no statistically significant interdepartmental difference in preparedness levels of preservice teachers on the skill set. In that sense, the following paragraphs discuss the findings respectively.

First, a statistically significant gender difference in preparedness levels of preservice teachers on divergent thinking under creativity and innovation was found in favour of females. That is, female senior preservice teachers were statistically more prepared in divergent thinking than males. When the literature on creativity was scrutinized for gender difference, it was disclosed that findings either indicate results in favour of females or underlines no difference between genders. Accordingly, while this

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particular finding is consistent with Temizkalp (2010)'s finding. In the study, researcher underlined that a significant gender difference was discovered in favour of female preservice teachers on the subdomain called elaboration under creativity. However, the significant gender difference in the present study is inconsistent with Topoğlu (2015)'s findings, concluding that although female preservice teachers slightly scored higher than males, there exists an insignificant difference between genders in terms of their creativity levels. Moreover, Kaufman (2006) conducted a study with 3553 participants with an aim to shed light on female and male perceptions of creativity in different areas of professions. The research revealed that there exists a gender difference in self-reported creativity and while females scored significantly higher in social and visual arts professions including teaching, males scored higher in science and sports professions such as mechanical and sports performance. Considering these findings, the reason behind the revealed gender difference in divergent thinking may be due to females' tendencies to perceive themselves more creative in especially teaching profession (Kaufman, 2006).

Second, a statistically significant difference in preparedness levels of preservice teachers on creation and evaluation under critical thinking and problem solving was also found in favour of females. That is, female senior preservice teachers were statistically more prepared in creation and evaluation of critical thinking and problem-solving skill than males. When the literature on critical thinking and problem solving was scrutinized for gender difference, it was revealed that findings are inconsistent. In that sense, according to the studies carried out by Demiral (2018) with 200 prospective teachers and Kutluca (2018) with 471 preservice teachers, the results underlined that there exists no significant difference in prospective teachers' critical thinking and problem-solving skill. However, Erdem and Yazıcıoğlu (2015) conducted a study with 924 preservice teachers and found that gender is a significant predictor of their critical thinking and problem-solving skill through a regression analysis. Accordingly, while, in another research carried out by Erdem and Yazıcıoğlu (2015), they found that male preservice teachers' critical thinking tendencies are significantly higher than females, Çetinkaya's (2011) research revealed that a significant difference in critical thinking

tendencies were evident in favour of female preservice teachers. Moreover, Gülveren (2007) researched with 1302 preservice teachers to determine their critical thinking skill levels and the results showed a significant gender difference in terms of females. Considering all these studies, it is apparent that the particular finding from the present research is aligning with the previously mentioned studies in favour of females (Çetinkaya, 2011; Gülveren, 2007). Such a difference may result from female preservice teachers' tendencies towards utilization of critical thinking more than males.

Additionally, it was found that although there exist differences in preparedness levels in accordance with their departments, these interdepartmental differences were not statistically significant. The particular finding is consistent with results of the studies on each skill in the learning and innovation skill set (Gülveren, 2007; Kutluca, 2018; Örün, Orhan, Dönmez, & Kurt, 2015; Tan & Tan, 2016; Topoğlu, 2015; Yiğitcan-Nayir & Tekmen, 2017). Teacher education programs in Turkey are transformed under influence of the Bologna Process based on the Qualifications Framework (CoHE, 2017) and their curriculum are revised to align with the competencies expected in the teaching profession proposed by the Ministry (MoNE, 2017). Considering that teacher preparation curriculum in Turkey covers the overarching skills such as 4Cs in their learning outcomes (MoNE, 2017), it is reasonable that there is no interdepartmental difference in preservice teachers' preparedness levels on learning and innovation skills encompassing the 4Cs.

To sum up, while between-gender variations on preparedness levels indicated a significant female superiority in the domain named divergent thinking under creativity and innovation and in another domain called creation and evaluation under critical thinking and problem solving, interdepartmental differences on preparedness levels showed insignificant variances. In that sense, to close the significant gender gap in preparedness levels, teacher education programs might support preservice teachers with extracurricular activities, workshops, and informative seminars. The following sections are to provide implications for both practice and further research.

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5.5 Implications for Practice

In order to raise citizens of tomorrow possessing crucial skills that enable them to survive in an everchanging economy and society, teachers should first acquire the demanding skills to transfer them to youth. From such a perspective, it is undeniable that teacher education programs play a vital role to achieve this social goal. In that sense, it must first be assured that teacher education programs adequately convey the skills to preservice teachers. For that reason, the purpose of the current study was mainly to investigate preservice teachers' perceptions of their preparedness levels on learning and innovation skills in a prestigious state research university in Turkey. Hence, the implications for practice especially to be utilized in the university where the research was carried out are given in accordance with the discussions of findings in the following paragraphs.

To begin with, teacher education programs in the faculty of education should take an immediate action on both enriching the knowledge of preservice teachers on the 21st century movement including the overarching skills and cultivating their experiences on the skills through curricular and extracurricular practices during their preparation years.

Regarding the former; enriching the knowledge of preservice teachers on the 21st century movement including the overarching skills, preservice teachers request in the open-ended part in PLeSLIS that they, first of all, demand informative seminars explaining 21st century movement and answering questions preservice teachers constructed over years in teacher education. Then, they also demand that their programs further inform them about how to integrate these skills coming with 21st century movement into daily practice and how to transfer these skills through teaching.

Regarding the latter action; cultivating preservice teachers' experiences on the skills through curricular and extracurricular practices, preservice teachers also ask both for more opportunity integration into teacher education curriculum to enable them to excel these skills and for extracurricular activities such as games, drama, workshops and

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events to learn and experience each skill in the learning and innovation skills. These skills in this research was 4Cs involving creativity and innovation, critical thinking and problem solving, collaboration, and communication. According to the results of the current study, especially innovation, and critical thinking and problem solving were the ones with worrying results. If teacher education programs respond to preservice teachers' demands on being informed about these skills and being provided with either curricular or extracurricular opportunities to master these skills, the problems revealed from the current study about these skills might be minimalized or even eliminated.

Moreover, when the descriptive statistics on preparedness levels of preservice teachers were examined in relation to their departments, a pattern was found on which departments held the lowest and highest preparedness levels. In that sense, while CEIT consistently scored the lowest preparedness levels on all learning and innovation skills, ESE dominantly scored the highest almost all domains of the skills (7 out of 8). The pattern was broken in favour of the department of ECE when it scored the highest preparedness level on divergent thinking. First of all, reasons of such a pattern need to be investigated in further research and not only CEIT but also other teacher education programs should understand the reasons behind. Then, stakeholders participating in curriculum development and revision processes of these departments should consider implementing proper actions to prepare their teachers better. As a valuable example for such an action, a course on creativity similar to the compulsory course in ECE curriculum might be offered in all teacher education programs. In this way, interdepartmental variations might be minimalized in divergent thinking or creativity. Moreover, such an action, in fact, could be taken for each learning and innovation skill as separate courses. If this action is not feasible, one comprehensive course encompassing learning and innovation skills may be developed and offered in teacher education programs giving service in the 21st century.

From the statistical examination of preparedness levels of prospective teachers on learning and innovation skills, it was disclosed that there were insignificant

interdepartmental variations and a significant gender difference for divergent thinking (a domain under creativity and innovation) and creation and evaluation (a domain under critical thinking and problem solving) in favour of females. To eliminate these differences and even prepare preservice teachers better, the previously mentioned actions could be taken in unison by all teacher education programs in the university. In that sense, the programs might prepare a joint informative seminar and also cooperate to provide them with joint extracurricular activities on the 21st century movement and skills. In this manner, these overarching-skill-related learning objectives, which are already embedded into teacher preparation curricula by MoNE in the light of Bologna Process (MoNE, 2017), could be further reinforced. In the end, more competent teachers would graduate from the programs and prepare more capable citizens of tomorrow.

5.6 Implications for Further Research

The present study embraced a survey design and therefore provided the literature on teacher education with interesting results but with no reasons. Hence, the current study disclosed many topics to be further investigated. In that sense, the following recommendations are proposed.

This study mainly employed a quantitative approach to investigate preparedness levels of preservice teachers on learning and innovation skills from their perspectives. Therefore:

- To begin with, starting from the 2018-2019 academic year, teacher education programs in Turkey were once again changed. To examine the latest policy impact, the same study might be conducted once again in the 2021-2022 academic year with the senior preservice teachers of the latest policy to compare the situation with the current study.
- A qualitative version of the current study might be helpful to deeply investigate the topic to provide more insight on the development of learning and innovation skills on preservice teachers.

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- Further research could hold an aim to estimate their actual skill levels, in addition to their preparedness levels, either as a compact study of learning and innovation skills or for each skill separately.

- Since the present study utilized preservice teachers' perceptions to estimate their preparedness levels, further studies might investigate preservice teachers' preparedness levels from different angles. For example, investigating preservice teachers' preparedness levels from their teacher educators' perspectives might be helpful to enrich the information on the issue.

- The current study was conducted in a state research university in which medium of instruction is English. The same study might be conducted in other universities in Turkey in which their medium of instruction is Turkish to see if there exist differences.

Moreover, Phase I of the present study investigated indicators of teachers possessing each learning and innovation skills from preservice teachers' perspectives. The worrying results pointed out that while there are preservice teachers who does not know the terms innovation or innovative teacher and critical thinking or critical thinker. Additionally, the term innovation from preservice teachers' perceptions revolves around either being related to self-development or related to technology integration in education. Furthermore, there is a lack of knowledge on systematic approaches to problem solving on preservice teachers.

- Reasons of why preservice teachers does not know the term innovation and critical thinking might be investigated through in-depth qualitative studies. These might include interviews and also document analysis on teacher education programs to see if the curriculum provides preservice teachers with enough opportunities to develop these concepts actually and properly.

- The lack of systematic approach to problem solving on preservice teachers' perceptions could be further investigated as well.

From the results of Phase II, it was revealed that there is a consistent pattern of which departments hold the lowest and highest scores on each domain of learning and innovation skill set. That is, while the department of CEIT holds the lowest preparedness levels on all domains of learning and innovation skills, the department of ESE, on the contrary, holds the highest preparedness levels on 7 out of 8 domains of the mentioned skill set. Moreover, the department of ECE scored the highest preparedness level on divergent thinking (a domain under creativity and innovation).

- Since the present study was conducted through a survey design, reasons for the lowest and highest preparedness levels cannot be clarified. Therefore, reasons of such a pattern could be examined in further in-depth qualitative research.
- Moreover, an experimental study can be carried out for the compulsory course called creativity and children offered in the department of ECE to see if the course is significantly boosting the preservice teacher's perceptions on the skill and their actual skill levels.

The present study found that there were significant gender differences on preparedness levels of preservice teachers for divergent thinking (a domain under creativity and innovation) and creation and evaluation (a domain under critical thinking and problem solving) in favour of females.

- Although both could be justified with females' tendencies to perceive themselves more creative in especially teaching profession and their tendencies towards the utilization of critical thinking more than males, discovering explicit and empirical reasons of them could be another research's purposes.
- In this study, preservice teachers were specifically asked to consider their teacher preparation programs while rating the extent their departments prepare them on learning and innovation skills. Still, the further research can include an independent variable for the type of secondary school they graduated to see if there is a background effect on their preparedness level.

- Moreover, human capital in family might also affect preparedness levels of preservice teachers. Therefore, this variable might also be added into demographics in further studies.

- In the study, preparedness levels of only senior preservice teachers were calculated. To check a grade level difference, freshmen, sophomore and junior students might also be included in further research.

Finally, from the open-ended part of PLeSLIS, the following suggestions for further research were disclosed.

- One preservice teacher suggested that future research could cover how preservice teachers might benefit more from ICT in teacher education programs through action studies.

- Two preservice teachers recommended to include Endurance and Individualism as personality traits of 21st century learners in further research.

- Since preservice teachers demand extracurricular activities for 21st century movement and skills, a possible implementation of such an activity could also be investigated either as a case study or as an experimental research.

REFERENCES

Ainsworth, J. (Ed.) (2013). *Sociology of education: An a-to-z guide*. Thousand Oaks, CA: SAGE Publications, Inc. doi: 10.4135/9781452276151

Akça, F., & Şakar, Z. (2017). Öğretmen adaylarının bireysel yenilikçilik düzeylerinin incelenmesi. *Pegem Atıf İndeksi*, 451-462. doi: 10.14527/9786053188407.29

Ala-Mutka, K., Punie, Y., & Redecker, C. (2008). Digital competence for lifelong learning. *Institute for Prospective Technological Studies (IPTS), European Commission, Joint Research Centre. Technical Note: JRC*, *48708*, 271-282.

Al-Oweidi, A. (2013). Creative Characteristics and Its Relation to Achievement and School Type among Jordanian Students. *Creative Education, 4*(1), 29-34.

Althof, W., & Berkowitz, M. W. (2006). Moral education and character education: Their relationship and roles in citizenship education. *Journal of moral education*, *35*(4), 495-518.

Amabile, T. M., & Pillemer, J. (2012). Perspectives on the social psychology of creativity. *The Journal of Creative Behavior*, *46*(1), 3-15.

Ammentorp, L., & Madden, L. (2018, January). Learning from others: Developing preservice teachers' workplace skills. In *The Educational Forum* (Vol. 82, No. 1, pp. 85-96). Routledge.

Ananiadou, K. & Claro, M. (2009). *21st Century Skills and Competences for New Millennium Learners in OECD Countries*. OECD Education Working Papers, No. 41. Paris: OECD Publishing. doi:10.1787/218525261154.

Anderson, R. E. (2008). Implications of the information and knowledge society for education. In *International handbook of information technology in primary and secondary education* (pp. 5-22). Boston, MA: Springer.

Baartman, L. K., & De Bruijn, E. (2011). Integrating knowledge, skills and attitudes: Conceptualising learning processes towards vocational competence. *Educational Research Review*, *6*(2), 125-134.

Balistreri, S., Di Giacomo, F. T., Ptak, T., & Noisette, I. (2012). *Global education: Connections, Concepts and Careers*. Research in Review 2012-4. College Board Publication.

Barker, O. (2006, May 29). Technology leaves teens speechless: Text-messaging is wiping out the art of conversation [Blog Post]. Retrieved from https://usatoday30.usatoday.com/tech/news/techinnovations/2006-05-29-teen-texting_x.htm.

Bates, S. (2006). How leaders communicate big ideas to drive business results. *Employment Relations Today*, *33*(3), 13-19.

Beghetto, R. A. (2005). Does assessment kill student creativity? *The educational forum 69*(3). 254-263. Taylor & Francis Group.

Beghetto, R. A. (2007). Does creativity have a place in classroom discussions? Prospective teachers' response preferences. *Thinking skills and creativity*, *2*(1), 1-9.

Bellanca, J. A. (Ed.). (2010). *21st century skills: Rethinking how students learn*. Bloomington, IN: Solution Tree Press.

Berry, B. (2010). *The teachers of 2030: Creating a Student-centered Profession for the 21st Century*. New York: MetLife Foundation.

Berry, L. (2005). What's so important about communication? Plenty. *Mississippi Business Journal*, *27*(11), 30-31.

Bills, D. B. (2004). *The sociology of education and work*. Oxford: Blackwell.

Bridges, D. (2000). Back to the future: The higher education curriculum in the 21st century. *Cambridge Journal of Education*, *30*(1), 37-55.

Brown, M. (1994). An introduction to the discourse on competency-based training (CBT). *A collection of readings related to competency-based training*, 1-17.

Butler, H. A., Dwyer, C. P., Hogan, M. J., Franco, A., Rivas, S. F., Saiz, C., & Almeida, L. S. (2012). The Halpern Critical Thinking Assessment and real-world outcomes: Cross-national applications. *Thinking Skills and Creativity*, *7*(2), 112-121.

Cakmak, M., Budak, Y., & Kayabasi, Y. (2018). Graduate Students' Perspectives on The Qualities of Innovative Teachers. *Hacettepe Universitesi Egitim Fakultesi Dergisi-hacettepe University Journal of Education, 33*(3), 644-655.

Case, R. (2005). Moving critical thinking to the main stage. *Education Canada*, *45*(2), 45-49.

Castells, M. (2010). *The rise of the network society. The Information age: Economy, society, and culture*. Oxford, UK: Wiley-Blackwell.

Çetinkaya, Z. (2011). Türkçe öğretmen adaylarının eleştirel düşünmeye ilişkin görüşlerinin belirlenmesi. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi*, *12*(3), 93-108.

Chu, S. K. W., Reynolds, R. B., Tavares, N. J., Notari, M., & Lee, C. W. Y. (2017). Twenty-First Century Skills and Global Education Roadmaps. In *21st Century Skills Development Through Inquiry-Based Learning* (pp. 17-32). Singapore: Springer.

Cline, S. (2005, April 1). Soft skills make the difference in the workplace [Blog Post]. Retrieved from https://www.csbj.com/2005/04/01/soft-skills-make-the-difference-in-the-workplace/.

Coggshall, J. G. (2007). *Communication Framework for Measuring Teacher Quality and Effectiveness: Bringing Coherence to the Conversation*. National

Comprehensive Center for Teacher Quality Publication. Retrieved from
https://gtlcenter.org/sites/default/files/docs/NCCTQCommFramework.pdf

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155–159.
doi:10.1037/0033-2909.112.1.155.

Comrey, A. L., & Lee, H. B. (2013). *A first course in factor analysis*. Psychology
Press.

Craft, A. (2003). *Creativity across the primary curriculum: Framing and developing
practice*. London: Routledge.

Dannels, D. P. (2001). Taking the Pulse of Communication Across the Curriculum:
A View from the Trenches. *JACA: Journal of the Association for
Communication Administration*, *30*(2), 50-70.

Darling-Hammond, L. (1997). *Doing what matters most: Investing in quality
teaching*. New York: National Commission on Teaching & America's Future
Publication.

Darling-Hammond, L. (2006). Constructing 21st-century teacher education. *Journal
of teacher education*, *57*(3), 300-314.

Darling-Hammond, L., Chung, R., & Frelow, F. (2002). Variation in teacher
preparation: How well do different pathways prepare teachers to teach?
Journal of teacher education, *53*(4), 286-302.

Davis, H., Hartshorne, R., & Ring, G. (2010). Being an innovative teacher:
preservice teachers' conceptions of technology and innovation. *International
Journal of Education*, *2*(1), 1-28. doi:10.5296/ije.v2i1.242

De Schrijver, A. (2012). Sample survey on sensitive topics: Investigating
respondents' understanding and trust in alternative versions of the randomized
response technique. *Journal of Research Practice*, *8*(1), 1-17.

De Vaus, D. (2013). *Surveys in social research*. New York: Routledge.

Dede, C. (2007). *Transforming education for the 21st century: New pedagogies that help all students attain sophisticated learning outcomes*. NCSU Friday Institute Publication.

Dede, C. (2010). Comparing frameworks for 21st century skills. *21st century skills: Rethinking how students learn*, *20*, 51-76.

Demiral, U. (2018). Examination of Critical Thinking Skills of Preservice Science Teachers: A Perspective of Social Constructivist Theory. *Journal of Education and Learning, 7*(4), 179-190.

Dere, Z. (2017). Yaratıcılık ve geliştirilmesi dersinin öğretmen adaylarının yaratıcılıklarına etkisinin incelenmesi. *Social Sciences Studies Journal (SSSJournal)*, *3*(10), 1192-1199.

Downing, J. E. (2005). Inclusive education for high school students with severe intellectual disabilities: Supporting communication. *Augmentative and Alternative Communication*, *21*(2), 132-148.

Druskat, V. U., & Kayes, D. C. (2000). Learning versus performance in short-term project teams. *Small group research*, *31*(3), 328-353.

Du-Babcock, B. (2006). Teaching business communication: Past, present, and future. *The Journal of Business Communication (1973)*, *43*(3), 253-264.

Dunning, J. H. (2000). Regions, globalization, and the knowledge economy: Issues stated. In J.H. Dunning (Ed.), *Regions, globalization, and the knowledge-based economy*. (pp. 7-41). Oxford: Oxford University Press.

Durkheim, E. (1956). *Education and Sociology*. New York: Free Press.

Elkatmış, M., & Ünal, E. (2014). Sınıf öğretmeni adaylarının iletişim beceri düzeylerine yönelik bir çalışma. *Trakya Üniversitesi Sosyal Bilimler Dergisi*, *16*(1), 107-122.

Erdamar, G. K., & Demirel, H. (2010). Öğretmen adaylarının grup çalışmalarına ilişkin algıları. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi*, *11*(3), 205-223.

Erdem, A. R., & Yazıcıoğlu, A. (2015). Öğretmen Adaylarının Problem Çözme Becerileri İle Eleştirel Düşünme Becerileri Arasındaki İlişki. *OPUS Uluslararası Toplum Araştırmaları Dergisi*, *5*(9), 27-41.

Eret-Orhan, E., Ok, A., & Capa-Aydin, Y. (2017). We train, but what do they think? Preservice teachers' perceptions of the adequacy of their teacher education in Turkey. *Asia-Pacific Journal of Teacher Education*, *46*(2), 183-198.

European Commission. (2008). *Explaining the European Qualifications Framework for Lifelong Learning*. Luxembourg: Office for Official Publications of the European Communities

Ferrari, A., Cachia, R., & Punie, Y. (2009). Innovation and creativity in education and training in the EU member states: Fostering creative learning and supporting innovative teaching. *JRC Technical Note*, *52374*, 64.

Ford, K. (2014). Competency-based education: History, opportunities, and challenges. *UMUC Center for Innovation in Learning and Student Success*, *10*, 1-21. doi: 10.13140/RG.2.1.4679.0885

Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of marketing research*, 382-388.

Gentry, R. (2012). Collaboration Skills Pre-Service Teachers Acquire in a Responsive Preparation Program. *Journal of Instructional Pedagogies*, *8.* 1-9.

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The qualitative report*, *8*(4), 597-606.

Gordon, J., Halász, G., Krawczyk, M., Leney, T., Michel, A., Pepper, D., & Wiśniewski, J. (2009). Key competences in Europe: Opening doors for lifelong learners across the school curriculum and teacher education. Warsaw: Center for Social and Economic Research (CASE). ISBN 978-83-7178-497-2.

Gorsuch, R. L. 1983. *Factor Analysis*. 2nd ed. Mahwah: Lawrence Erlbaum.

Greenhill, V. (2010). *21st Century Knowledge and Skills in Educator Preparation*. Partnership for 21st Century Learning Publications.

Griffin, P., Care, E., & McGaw, B. (2012). The changing role of education and schools. In *Assessment and teaching of 21st century skills* (pp. 1-15). Dordrecht: Springer.

Guilford, J. P. (1967). *The nature of human intelligence*. New York: McGraw-Hill.

Guilford, J. P. (1973). *Characteristics of Creativity*. Washington: ERIC Clearinghouse

Gülveren, H. (2007). Eğitim fakültesi öğrencilerinin eleştirel düşünme becerileri ve bu becerileri etkileyen eleştirel düşünme faktörleri. *Unpublished doctoral dissertation, Dokuz Eylül Üniversitesi, İzmir*.

Haeger, H., Lambert, A. D., Kinzie, J., & Gieser, J. (2012). Using cognitive interviews to improve survey instruments. *Association for Institutional Research, New Orleans*.

Hair Jr., J. F., Black, W.C., Babin, B.J. and Anderson, R.E. (2010) *Multivariate Data Analysis: A Global Perspective*. 7th Edition, Pearson Education, Upper Saddle River.

Hair, J. F. Jr., Anderson, R. E., Tatham, R. L. & Black, W. C. (1995). *Multivariate Data Analysis (3rd ed).* New York: Macmillan.

Halpern, D. F. (2013). *Critical thinking workshop for helping our students become better thinker*. University of Louisville Publications. Retrieved from https://louisville.edu/ideastoaction/-/files/featured/halpern/critical-thinking.pdf

Hatcher, L. (1994). A Step-by-Step Approach to Using the SAS® System for Factor Analysis and Structural Equation Modeling. Cary, N.C.: SAS Institute, Inc.

Heale, R., & Twycross, A. (2015). Validity and reliability in quantitative studies. *Evidence-based nursing*, *18*. 66-67. doi: 10.1136/eb-2015-102129

Helsel, C. R., & Hogg, M. C. (2006). Assessing communication proficiency in higher education: Speaking labs offer possibilities. *International Journal of Listening*, *20*(1), 29-54.

Hilton, M. (2008). Skills for work in the 21st century: What does the research tell us? *Academy of Management Perspectives*, *22*(4), 63-78.

Hunt, S., Wright, A., & Simonds, C. (2014). Securing the future of communication education: Advancing an advocacy and research agenda for the 21st century. *Communication Education*, *63*(4), 449-461.

İncebacak, B. B., Tungaç, A. S., & Yaman, S. (2018). Sınıf Öğretmenlerinin Gözünden Eğitimde Yenilik ve İnovasyon Kavramlarına Bir Bakış: Metafor Analizi. *Eskişehir Osmangazi Üniversitesi Türk Dünyası Uygulama ve Araştırma Merkezi Eğitim Dergisi*, *3*(2), 19-29.

James, R. (2002). Students' changing expectations of higher education and the consequences of mismatches with reality. *Responding to student expectations*, *1*, 71-83.

Kanik, F. (2010). An assessment of teachers' conceptions of critical thinking and practices for critical thinking development at seventh grade (Doctoral thesis,

Middle East Technical University, Ankara, Turkey). *Retrieved from etd.lib.metu.edu.tr/upload/12612523/index.pdf*.

Karseth, B. (2008). Qualifications frameworks for the European Higher Education Area: a new instrumentalism or 'Much Ado about Nothing'?, *Learning and Teaching, 1*(2), 77-101.

Kaufman, J. C. (2006). Self-reported differences in creativity by ethnicity and gender. Applied Cognitive Psychology: *The Official Journal of the Society for Applied Research in Memory and Cognition, 20*(8), 1065-1082.

Khan, A., Khan, S., Zia-Ul-Islam, S., & Khan, M. (2017). Communication Skills of a Teacher and Its Role in the Development of the Students' Academic Success. *Journal of Education and Practice*, *8*(1), 18-21.

Kuhn, D. (2015). Thinking together and alone. *Educational Researcher*, *44*(1), 46-53.

Kutluca, A. Y. (2018). Öğretmen Adaylarının Problem Çözme Becerilerini Yordayan Değişkenlerin İncelenmesi. *Asian Journal of Instruction*, *6*(1), 1-20.

Lai, E., DiCerbo, K. & Foltz, P. (2017). *Skills for Today: What We Know about Teaching and Assessing Collaboration*. London: Pearson

Lai, E., Yarbro, J., DiCerbo, K., & Geest, E. (2018). *Skills for Today: What We Know about Teaching and Assessing Creativity*. London: Pearson.

Le, H., Janssen, J., & Wubbels, T. (2018). Collaborative learning practices: teacher and student perceived obstacles to effective student collaboration. *Cambridge Journal of Education*, *48*(1), 103-122.

Levin, K. A. (2006). Study design III: Cross-sectional studies. *Evidence-based dentistry*, *7*(1), 24-25. doi: 10.1038/sj.ebd.6400375

Levine, M. (2005). College graduates aren't ready for the real world. *The Chronicle of Higher Education*, *51*(24). ISSN-0009-5982

Levy, F., & Murnane, R. J. (2004). Education and the changing job market. *Educational leadership*, *62*(2), 80-83.

Mager, R. F. (1962). Preparing instructional objectives.

Martin, M. M., & Myers, S. A. (2006). Students' communication traits and their out-of-class communication with their instructors. *Communication Research Reports*, *23*(4), 283-289.

McClough, A. C., & Rogelberg, S. G. (2003). Selection in teams: An exploration of the teamwork knowledge, skills, and ability test. *International Journal of Selection and Assessment*, *11*(1), 56-66.

McCracken, S. R. (2006). Listening and new approaches to the creation of communication centers. *International Journal of Listening*, *20*(1), 60-61.

Metusalem, R., Belenky, D., & DiCerbo, K. (2017). *Skills for Today: What We Know about Teaching and Assessing Communication*. London: Pearson.

Michaels, R., Truesdell, E., & Brown, B. (2015). Incorporating 21st-century skills into teacher preparation programs: A collaborative approach. *Journal of Scholastic Inquiry: Education, 5*(1), 47–72.

Milli, M. S., & Yağcı, U. (2017). Öğretmen Adaylarının İletişim Becerilerinin İncelenmesi. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 17*(1), 286-298.

Moore, R., & Young, M. (2001). Knowledge and the curriculum in the sociology of education: Towards a reconceptualisation. *British Journal of Sociology of Education*, *22*(4), 445-461.

Morreale, S. P., & Pearson, J. C. (2008). Why communication education is important: The centrality of the discipline in the 21st century. *Communication Education*, *57*(2), 224-240.

Motamedi, V. (2017). Mastery learning: An effective teaching strategy. *Unpublished manuscript. Retrieved from http://www.nyu.edu/classes/keefer/waoe/ motamediv.htm.*

Mougel, N. (2011). World war I casualties. *Reperes Centre Européen Robert Schuman, 4*. 1-13.

Myers, S. A., Martin, M. M., & Knapp, J. L. (2005). Perceived instructor in-class communicative behaviors as a predictor of student participation in out of class communication. *Communication Quarterly*, *53*(4), 437-450.

National Education Association (NEA). (2014). *Preparing 21st century students for a global society: An educator's guide to the "Four Cs.".* Washington, DC: NEA Publication.

Nayir, Ö. Y., & Tekmen, B. (2017). Öğretmen Adaylarının Gözüyle Öğrenme Ortamlarının Akademik Motivasyon ve Problem Çözme Becerisine Katkısının İncelenmesi. *Başkent University Journal of Education*, *4*(2), 122-135.

Niess, M. L. (Ed.). (2016). Technological Pedagogical Content Knowledge (TPACK) Framework for K-12 Teacher Preparation: Emerging Research and Opportunities: Emerging Research and Opportunities. IGI Global.

Ocak, G., & Erşen, Z. B. (2015). Öğretmen Adaylarinin İletişim Becerileri Algilarinin İncelenmesi. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi; Sayı 33*; 1-19.

OECD (2005). *DeSeCo: The definition and selection of key competencies. Executive summary.* Paris: OCDE-USAID Publishing. Retrieved from http://www.oecd.org/pisa/35070367.pdf

OECD: Organization for Economic Co-operation and Development. (2013). *OECD skills outlook 2013: First results from the survey of adult skills*. Paris: OECD Publishing.

Örün, Ö., Orhan, D., Dönmez, P., & Kurt, A. A. (2015). Öğretmen adaylarının bireysel yenilikçilik profilleri ve teknoloji tutum düzeyleri arasındaki ilişkinin incelenmesi. *Trakya Üniversitesi Eğitim Fakültesi Dergisi*, *5*(1), 65-76.

Özgür, Ö., Orhan, D., Dönmez, P., & Kurt, A. A. (2015). Öğretmen adaylarının bireysel yenilikçilik profilleri ve teknoloji tutum düzeyleri arasındaki ilişkinin incelenmesi. *Trakya Üniversitesi Eğitim Fakültesi Dergisi*, *5*(1), 65-76.

Partnership for 21st Century Learning (2016). *Framework for 21st Century Learning*. Retrieved 1 October 2018 from http://www.p21.org/storage/documents/docs/P21_framework_0816.pdf

Partnership for 21st Century Learning. (2014). *Framework for State Action on Global Education*. P21 Publication.

Pehlivan, K. B. (2005). Öğretmen adaylarının iletişim becerisi algıları üzerine bir çalışma. *İlköğretim Online*, *4*(2), 17-23.

Prichard, J. S., Stratford, R. J., & Bizo, L. A. (2006). Team-skills training enhances collaborative learning. *Learning and instruction*, *16*(3), 256-265.

Republic of Turkey. Council of Higher Education. (2018). *News Arrangements for Undergraduate Teaching Programs*. Retrieved 20 November 2018 from https://goo.gl/THPqTL

Republic of Turkey. Ministry of National Education. (2006). *Öğretmenlik Mesleği Genel Yeterlilikleri*. Ankara: MoNE. Retrieved from http://oygm.meb.gov.tr/meb_iys_dosyalar/2017_12/13161921_YYretmenlik_MesleYi_Genel__YETERLYKLERi_onaylanan.pdf

Republic of Turkey. Ministry of National Education. (2017). *General Competencies for Teaching Profession*. Ankara: MoNE. Retrieved from

http://oygm.meb.gov.tr/meb_iys_dosyalar/2018_06/29111119_TeachersGeneralCompetencies.pdf

Richardson, J. T. E. (2005). Instruments for obtaining student feedback: A review of the literature. *Assessment & Evaluation in Higher Education, 30*(4), 387–415.

Russell, C. (2013). Functionalist theory of education. In J. Ainsworth (Ed.), *Sociology of education: An a-to-z guide* (Vol. 1, pp. 293-294). Thousand Oaks, CA: SAGE Publications, Inc. doi: 10.4135/9781452276151.n152

Schreglmann, S., & Kazancı, Z. (2016). Öğretmen adaylarının "yaratıcı öğretmen" kavramına yönelik metaforik algıları. *Üstün Zekâlılar Eğitimi ve Yaratıcılık Dergisi*, *3*(3), 21-34.

Scott, D. (2006). Six curriculum discourses: contestation and edification. In *Schooling, Society and Curriculum* (pp. 45-56). Routledge.

Scudder, V. (2004). The importance of communication in a global world. *Vital Speeches of the Day*, *70*(18), 559.

Skinner, B. F. (1957). The experimental analysis of behavior. *American scientist*, *45*(4), 343-371.

Solon, T. (2007). Generic Critical Thinking Infusion and Course Content Learning in Introductory Psychology. *Journal of Instructional Psychology*, *34*(2), 95-109.

Son, J. W., & Lee, M. Y. (2016). Preservice Teachers' Conception of Effective Problem-Solving Instruction and Their Problem Solving. *North American Chapter of the International Group for the Psychology of Mathematics Education*.

Sternberg, R. J. (2006). The nature of creativity. *Creativity research journal*, *18*(1), 87-98.

Stevens, M. J., & Campion, M. A. (1994). The knowledge, skill, and ability requirements for teamwork: Implications for human resource management. *Journal of Management, 20*(2), 503–530

Tabachnick, B. G. & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed). Allyn and Bacon, Needham Heights, Mass.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*. Boston, MA: Pearson Education.

Tan, Ç, & Tan, S. (2016). Öğretmen Adaylarının İletişim Becerileri ile Sınıfı Yönetme Becerileri Arasındaki İlişkinin İncelenmesi. *E-Kafkas Eğitim Araştırmaları Dergisi,3*(1), 1-14.

Temizkalp, G. (2010). Öğretmen adaylarının yaratıcılık düzeyleri. *Mehmet Akif Ersoy Üniversitesi: Yayımlanmamış Yüksek Lisans Tezi*.

Thompson, B. (2007). Exploratory and confirmatory factor analysis: Understanding concepts and applications. *Applied Psychological Measurement*, *31*(3), 245-248.

Tok, E. (2015). Okul Öncesi Öğretmen Adaylarinin Yaraticilik Kavramina İlişkin Algilarinin Metafor Analizi Yoluyla İncelenmesi. *International Journal of New Trends in Arts, Sports & Science Education (IJATSE), 4*(2), 1-8.

Topoğlu, O. (2015). Examination of creativity levels of teacher candidates who are educated in education faculty in terms of various variables (sample of Adnan Menderes University). *The Journal of Academic Social Science Studies*, *35*, 371-383.

Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times*. San Francisco, CA: Jossey-Bass.

Tucker, M. L., & McCarthy, A. M. (2001). Presentation self-efficacy: Increasing communication skills through service-learning. *Journal of Managerial Issues*, 227-244.

Urbani, J., Roshandel, S., Michaels, R., & Truesdell, E. (2017). Developing and Modeling 21st-Century Skills with Preservice Teachers. *Teacher Education Quarterly*, *44*(4), 27-50.

Vallima, J. & Hoffman, D. (2008) Knowledge society discourse and higher education. *Higher Education, 56*(3). 265-285

Varga, R. (2011). The importance of enhancing critical thinking skill of pre-service teachers. *Képzés és Gyakorlat/Training and Practice*, *9*(1-2), 97-106.

Ventura, M., Lai, E., & DiCerbo, K. (2017). *Skills for Today: What We Know about Teaching and Assessing Critical Thinking*. London: Pearson

Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies. *Journal of curriculum studies*, *44*(3), 299-321.

Weiss, M. P., Pellegrino, A., & Brigham, F. J. (2017). Practicing collaboration in teacher preparation: Effects of learning by doing together. *Teacher Education and Special Education*, *40*(1), 65-76.

Westby, E. L., & Dawson, V. L. (1995). Creativity: Asset or burden in the classroom? *Creativity Research Journal*, *8*(1), 1-10.

Westera, W. (2001). Competences in education: a confusion of tongues. *Journal of Curriculum studies*, *33*(1), 75-88.

Williams, B., Onsman, A., & Brown, T. (2010). Exploratory factor analysis: A five-step guide for novices. *Australasian Journal of Paramedicine*, *8*(3), 1-13.

Williams, R. L. (2005). Targeting critical thinking within teacher education: The potential impact on society. *The Teacher Educator*, *40*(3), 163-187.

Willingham, D. T. (2007). Critical thinking. *American Educator*, *31*(3), 8-19.

Wright, G., & Lewis, T., & Skaggs, P. T., & Howell, B. (2011, June), *Creativity and Innovation: A Comparative Analysis of Definitions and Assessment Measures.* Paper presented at 2011 ASEE Annual Conference & Exposition, Vancouver, BC. Retrieved from https://peer.asee.org/17680

Appendix A: Item Mean Statistics for PHED, CHED, & MHED

Skills and Domains	PHED (*n*=6)		CHED (*n*=7)		MHED (*n*=8)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Creativity and Innovation						
Divergent Thinking						
CI1	5.33	0.52	4.14	1.68	4.38	1.06
CI7	5.33	0.82	5.14	0.90	4.13	1.13
CI10	5.00	1.10	5.14	0.69	4.75	1.04
CI17	5.00	0.89	4.86	1.35	4.25	0.46
Total	5.17	0.83	4.82	1.15	4.38	0.92
Convergent Thinking						
CI2	5.00	1.55	5.00	0.82	4.63	1.06
CI3	4.67	1.37	5.29	1.11	4.50	0.93
CI4	4.33	1.21	4.71	1.11	4.38	1.30
CI5	5.17	1.17	4.14	1.07	4.63	0.74
CI6	5.33*	1.21	4.29	1.60	4.88	0.83
CI8	5.00	1.10	4.57	1.27	4.63	0.92
CI11	5.00	1.55	4.71	1.38	5.00	0.76
CI12	4.33	1.51	4.00	1.15	3.88	1.25
CI13	5.17	0.75	4.71	0.49	4.63	0.74
CI14	4.83	1.47	5.00	1.00	4.50	0.93
CI15	5.17	1.60	4.71	0.95	4.38	0.74
CI16	4.17	1.83	5.00	0.82	4.63	1.06

Skills and Domains	PHED (*n*=6)		CHED (*n*=7)		MHED (*n*=8)	
	M	*SD*	*M*	*SD*	*M*	*SD*
CI18	4.67	1.51	4.57	1.27	4.50	0.53
CI19	5.17	1.17	4.43	1.81	3.88	1.25
Total	4.86	1.36	4.65	1.13	4.50	0.93

Critical Thinking and Problem Solving

Systems and Argument Analysis

CP2	5.00	0.89	4.00	1.41	4.25	0.71
CP3	4.83	1.47	4.14	1.35	4.38	1.19
CP4	4.83	1.17	4.43	1.27	4.38	0.74
CP5	4.50	0.84	4.14	1.21	4.13	0.83
Total	4.79	1.09	4.18	1.31	4.28	0.87

Creation and Evaluation

CP1	4.67	0.52	4.86	0.69	4.63	0.92
CP6	4.67	1.37	4.86	1.46	4.63	0.92
CP7	5.17	0.75	4.71	1.38	5.00	0.53
CP9	5.17	1.17	4.71	0.95	4.75	0.71
CP10	5.00	1.55	4.86	1.35	4.38	0.52
CP11	5.00	1.10	5.00	0.58	4.88	0.83
CP13	5.33	0.82	5.29	1.11	4.63	0.74
CP14	5.67	0.52	5.57	0.79	5.00	0.53
Total	5.08	0.97	4.98	1.04	4.73	0.71

Collaboration

Interpersonal-Management

CL2	5.00	1.10	4.86	1.35	5.13	0.64
CL3	5.00	1.55	3.86	0.90	4.25	0.46
CL6	5.00	0.63	4.57	1.13	4.88	0.99
CL7	5.17	0.75	4.71	1.25	4.88	0.64
CL8	5.17	0.75	4.43	0.98	5.13	0.35
CL9	5.33	0.82	4.14	1.21	4.63	0.74

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Skills and Domains	PHED (*n*=6)		CHED (*n*=7)		MHED (*n*=8)	
	M	*SD*	*M*	*SD*	*M*	*SD*
CL11	5.00	1.26	4.57	0.98	4.50	0.53
Total	5.10	0.98	4.45	1.11	4.77	0.62
Leadership						
CL1	5.33	1.63	5.86	0.38	5.13	0.64
CL4	4.50	1.87	4.00	1.29	4.25	0.89
CL5	4.50	1.38	4.57	0.98	4.50	0.76
CL10	4.83	1.33	4.71	0.95	4.88	0.35
Total	4.79	1.55	4.79	0.90	4.69	0.66
Communication						
Active Listening						
CM1	5.17	0.98	5.14	1.46	4.50	1.60
CM2	4.83	0.98	4.71	0.76	4.50	0.76
CM8	5.00	1.10	4.71	1.11	4.75	0.71
CM12	5.33	1.21	4.29	1.80	4.63	0.92
CM14	4.83	0.41	4.00	1.15	4.13	0.83
CM15	5.17	0.98	4.43	1.51	4.88	0.64
CM16	6.00	0.00	5.86	0.38	5.00	0.93
Total	5.19	0.81	4.73	1.17	4.63	0.91
Audience Analysis						
CM3	5.17	1.60	5.00	1.00	4.88	0.64
CM7	4.17	1.72	3.86	1.46	4.63	0.74
CM9	5.00	1.10	4.57	1.51	4.63	0.92
CM11	5.33	0.52	4.43	1.40	4.50	0.76
CM13	5.00	1.26	4.29	1.38	5.00	0.76
Total	4.93	1.24	4.43	1.35	4.73	0.76

Note: Assessment on 6-point rating scale; 6= "Very Adequate" and 1= "Very Inadequate"

Appendix B: Details of Open-Ended Part in PLeSLIS

Themes and Their Details Revealed from the Optional Open-Ended Part

Theme	Detail	Participant Details	
		Number	*Dept*
	O: Satisfaction with the course of creativity	127	ECE
	O: Dissatisfaction with the existing approaches used to transfer the skills	135	ECE
	O: A complaint about the extent to which the faculty members possess these learning and innovation skills	134	ECE
	O: A problem on the execution of conflict-resolution strategies among preservice teachers	151	EME
Acquisition of the Skills	O: An effect of the background of learners on the acquisition of these skills	78	ESE
	N: A need for more ICT courses to be included in teacher education curricula	181 &184	EME
	N: A need that courses in curriculum focus more on how to integrate the 21st-century skills into daily life	61	ESE
	N: Less content focus, more opportunity provided for preservice teachers to excel at the skills	107	ECE
	N: A need for extracurricular activities such as games, drama, workshops and events designed and served within the scope of the faculty of education	99	ESE

Themes and Their Details Revealed from the Optional Open-Ended Part

Theme	Detail	Participant Details	
		Number	*Dept*
	N: A need to know how to transfer these 21st-century skills to the next generation as a teacher of tomorrow	33	FLE
	N: A need for a seminar explaining the 21st-century movement and answering questions preservice teachers constructed over years in teacher education	153	PHED
Suggestions as either 21st-century knowledge or skills	GA: An ability to empathize, to maintain an eye-contact, and communicate with body language	65 & 66	FLE
	GA: Group-work, leadership, and ICT	60	ESE
	PT: Endurance	13	EME
	PT: Individualism	188	FLE
	ICT: Inclusion of ICT domain into studies on teacher education in the 21st century	176	EME
	ICT: Following technological developments as an indicator for ICT-related dispositions of teachers	158 & 165	EME
	ICT: Future research could also cover how preservice teachers might benefit more from ICT in teacher education	191	FLE
	ICT: Existence of a pre-set consideration of associating the notion of teacher education in the 21st century with ICT integration into education	64	FLE
	ICT: Involvement of indicators related to the teaching field proficiency	175	EME

O: Opinion, N: Need, GA: Generic-Ability, PT: Personality Trait, ICT: Information and Communication Technology

Appendix C: Human Subjects Ethics Committee Permission

Sayı: 28620816 / 625

11 ARALIK 2018

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Doç.Dr. Hanife AKAR

Danışmanlığını yaptığınız Sercan ERER'in **"Geleceğin Öğretmenlerini 21. Yüzyıl için Yetiştiriyor Muyuz? Öğretmen Adayları Bakış Açılarından Öğretmen Eğitimi Programlarının Öğrenme ve İnovasyon Becerileri Üzerine Hazırlık Seviyelerinin Kapsamlı İncelenmesi"** başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülerek gerekli onay **2018-EGT-172** protokol numarası ile araştırma yapması onaylanmıştır.

Saygılarımla bilgilerinize sunarım.

Prof. Dr. Tülin GENÇÖZ

Başkan

Prof. Dr. Ayhan SOL

Üye

Prof. Dr. Ayhan Gürbüz DEMİR

Üye

Prof.Dr. Yaşar KONDAKÇI (u.)

Üye

Dr. Öğr. Üyesi Ali Emre TURGUT

Üye

Doç. Dr. Emre SELÇUK

Üye

Doç.Dr. Üyesi Pınar KAYGAN

Üye

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Appendix D: Informed Consent Form

ARAŞTIRMAYA GÖNÜLLÜ KATILIM FORMU

Bu çalışma ODTÜ Eğitim Programları ve Öğretim Bölümü Yüksek lisans öğrencisi Sercan Erer tarafından "Geleceğin Öğretmenlerini 21. Yüzyıl için Yetiştiriyor Muyuz? Öğretmen Adayları Bakış Açılarından Öğretmen Eğitimi Programlarının Öğrenme ve İnovasyon Becerileri Üzerine Hazırlık Seviyelerinin Kapsamlı İncelenmesi" isimli tez çalışması kapsamında Eğitim Programları ve Öğretim Bölümü öğretim üyelerinden Doç. Dr. Hanife Akar gözetmenliğinde yürütülmektedir. Bu form sizi araştırma koşulları hakkında bilgilendirmek için hazırlanmıştır.

Çalışmanın Amacı Nedir?

Bu çalışma ile 21. Yüzyıl öğrenme ve innovasyon yetkinliklerinin göstergelerinin geleceğin öğretmenleri tarafından belirlenmesi, bu yetkinliklerin geleceğin öğretmenlerine öğretmenlik eğitimi süresince ne derece kazandırıldığının geleceğin öğretmenlerinin bakış açılarından değerlendirilmesi ve değerlendirmede ortaya çıkabilecek farklılıklarının bireysel değişkenler üzerinden incelenmesi amaçlanmaktadır.

Bize Nasıl Yardımcı Olmanızı İsteyeceğiz?

Ankete katılmak için eğitim fakültesi son sınıf öğrencisi olmanız gerekmektedir. Araştırmaya katılmayı kabul ederseniz, sizden beklenen, ankette yer alan 63 soruyu derecelendirme ölçeği üzerinde yanıtlamanızdır. Bu çalışmaya katılım ortalama olarak 15 dakika sürmektedir.

Sizden Topladığımız Bilgileri Nasıl Kullanacağız?

Araştırmaya katılımınız tamamen gönüllülük temelinde olmalıdır. Ankette, sizden kimlik veya kurum belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamıyla gizli tutulacak, sadece araştırmacılar tarafından değerlendirilecektir. Katılımcılardan elde edilecek bilgiler toplu halde değerlendirilecek ve bilimsel yayımlarda kullanılacaktır. Sağladığınız veriler gönüllü katılım formlarında toplanan kimlik bilgileri ile eşleştirilmeyecektir.

Katılımınızla ilgili bilmeniz gerekenler:

Anket, genel olarak kişisel rahatsızlık verecek ifadeler içermemektedir. Ancak, katılım sırasında ifadelerden ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz cevaplamayı yarıda bırakıp çıkmakta serbestsiniz. Böyle bir durumda anketi uygulayan kişiye, anketi tamamlamadığınızı söylemeniz yeterli olacaktır.

Araştırmayla ilgili daha fazla bilgi almak isterseniz:

Anket sonunda, bu çalışmayla ilgili sorularınız cevaplanacaktır. Bu çalışmaya katıldığınız için şimdiden teşekkür ederiz. Çalışma hakkında daha fazla bilgi almak için Eğitim Programları ve Öğretim Bölümü öğretim üyelerinden Doç. Dr. Hanife Akar (E-posta: hanif@metu.edu.tr) ya da yüksek lisans öğrencisi Sercan Erer (E-posta: sercan.erer@metu.edu.tr) ile iletişim kurabilirsiniz.

Yukarıdaki bilgileri okudum ve bu çalışmaya tamamen gönüllü olarak katılıyorum.

(Formu doldurup imzaladıktan sonra uygulayıcıya geri veriniz).

İsim Soyad   Tarih   İmza

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BİR ARAŞTIRMA ÜNİVERSİTESİNDEKİ ÖĞRETMEN ADAYLARININ ALGILARINA GÖRE ÖĞRENME VE İNOVASYON BECERİLERİNE HAZIRBULUNUŞLUK SEVİYELERİNİN İNCELENMESİ

Giriş

Araştırmanın Amacı ve Önemi

Dünya vatandaşı yetiştirmek eğitimin ana amaçlarından bir tanesidir (Balistreri, Di Giacomo, Noisette & Ptak, 2012). Bu durum, toplumların kaçınılamaz şekilde enternasyonel, birbirine bağımlı ve çok çeşitli oldukları göz önünde bulundurulduğunda, özellikle 21. Yüzyılda hayati önem taşımaktadır (P21, 2014). Dolayısıyla, eğitimin üzerinde olan bu hayati görevin bir kısmı da artan ve ağırlaşan bir şekilde öğretmenlerin üzerindedir. Hatta, öğretmenlerin bu görevi alanyazındaki bazı araştırmacılar tarafından da vurgulanmaktadır (Berry, 2010; Castells 2010). Fakat, olaya sadece bu bakış açısından yaklaşmak, öğretmen eğitimcilerinin bakışından bu olaya bakma ihtiyacını atlamamıza sebep olabilir. Başka bir ifadeyle, geleceğin dünya vatandaşlarını yetiştirebilmek için onlara aktarılması beklenen yeterliklere veya becerilere öncelikle öğretmen adaylarının sahip olmaları gerektiğini unutmamalıyız. Bu yüzden, öğretmenlerin hem 21. Yüzyıl dünya vatandaşları olmaları hemde geleceğin vatandaşlarını yetiştirebilmeleri için 21. Yüzyıl becerilerinin öğretmen eğitimi programlarına entegrasyonu uluslararası ve ulusal seviyede vurgulanmıştır.

American Association of Colleges for Teacher Education ve Partnership for 21st Century Learning 21. yüzyılda öğretmen eğitimi konusuna değinmek için toplandılar ve 21. Yüzyıl becerilerinin öğretmen eğitmi programlarına entegrasyonun temel

ilkelerini belirlediler (Greenhill, 2010). Bu bağlamda, Greenhill'in (2010) de söylediği gibi, bu işbirliği öğretmen eğitimi programlarından evrensel olarak beklenenin 21. yüzyıl becerilerini öğretebilen ve ölçebilen öğretmen adayı yetiştirmenin yanı sıra bu becerilere sahip öğretmenler yetiştirmek olduğunun altını çizdi. Hatta, öğretmen adaylarının değişim katalizörleri olarak yetiştirilmeleri gerektiği ayrıca vurgulandı. Öte yandan, öğretmen eğitim programlarının öğretmen adaylarını geleceğin değişim katalizörleri olarak yetiştirebilmesi için hangi beceri kitinin bu eğitim programlarında aktarılması gerektiği ise tartışmalara konu oldu. Tam da bu noktada, Partnership for 21st Century Learning çözüm olarak öğrenme ve innovasyon becerileri'ni önerdi çünkü bu becerilerde uzmanlık sürekli değişen durumlarla başa çıkabilen başarılı bir 21. Yüzyıl insanının güvenilir bir göstergesi olarak öne sürüldü (Chu ve diğerleri, 2017).

Türkiye, özellikle 21. Yüzyıl akımı ile Türkiye'deki öğretmenlik mesleğinin uyumunu sağlayabilmek için, yeterliklerin belirlenmesi ve öğretmen eğitimi programlarının bu yeterliklerle uyumlu hale gelebilmesi için harekete geçti (MEB, 2017). Bu ulusal çabalar, ya yeterliklerin belirlenmesi üzerine ya da belirlenen yeterliklerin güncellenmesi üzerine 2002, 2006 ve 2017 yıllarında ki farklı idari çalışmalarıda beraberinde getirdi. Yine de, bu çalışmaların ürünü olan tüm belgeler ortak olarak öğretmenleri 4C olarak da bilinen öğrenme ve innovasyon becerileri ile donatmanın önemini vurguladı. Daha açık bir ifadeyle, öğrenme ve innovasyon becerileri ilk olarak öğretmenlerin kişisel gelişimleri ile ilişkilendirildi (MEB, 2006). Dahası, belgeler Türkiye'deki öğrencilere 4C becerilerinin aktarılabilmesi için öncelikle öğretmenlerden bu becerilere sahip olmalarının ve kullanmalarının beklendiğinin altını çizdi (MEB, 2006). Hatta, 2017 yılında yayımlanan belge Türkiye'nin devam eden öğrenme ve inovasyon becerilerine sahip 21. Yüzyıl vatandaşı yetiştirme amacını ve böylesine bir amaçta öğretmen eğitimin yerini vurguladı (MEB, 2017). Görünüşe göre, 21. Yüzyıl akımı ile sadece Türkiye'deki vatandaşlardan beklenen yetkinlikler değil, aynı zamanda 21. Yüzyıl öğretmenlerinin sahip olmaları beklenen beceriler de hem uluslararası hemde ulusal düzeyde değişime uğradı. Bununla birlikte, Türkiyedeki

öğretmen eğitimi programlarından öğrencilerini 21. Yüzyıl'daki öğretmenlik mesleğine hazırlaması beklenmetedir.

Maalesef, tüm öğretmen eğitimi programları aynı seviyede 21. Yüzyılın gerekliliklerine, ihtiyaçlarına ve 21. Yüzyıldaki öğretmenlik meseleğine hazır bireyler yetiştiremiyorlar (Darling-Hammond, 2006; Darling-Hammond, Chung, & Frelow, 2002; Darling-Hammond, 1997). Bu sebeple, öğretmen eğitimi alanındaki başka bir ilgi de öğretmen eğitimi programlarının 21. Yüzyıl konu, tema ve becerilerine uyumunun değerlendirilmesidir. Bu zamana kadar, görevdeki öğretmenlerin 21. Yüzyıl becerilerine sahip olup olmadığını inceleyen araştırmalara sıklıkla rastlanırken, öğretmen eğitimi alanında bu tarz çalışmalara nadir olarak rastlanmaktadır (Urbani, Roshandel, Michaels & Truesdell, 2017). Bu konuda, Eret-Orhan, Ok & Capa-Aydin (2017), öğretmen eğitimi progrmlarından sorumlu olan kişilere eğitim programı geliştirme ve uygulamada alacakları kararları kolaylaştırabilecek araştırma verilerini de sunmak için, öğretmen adaylarının aldıkları öğretmenlik eğitimi üzerine bakış açılarının incelenmesinin, bu çalışmaların devamlılığının ve güncel tutulmasının önemli olduğunu vurguladılar.

Bütün bahsedilenleri göz önünde bulundurunca, öğretmen eğitimcilerinin eğitim programlarını değerlendirirken öğretmen adaylarının bakışaçılarına başvurmaktan kaçınmamaları gerektiği aşikar. Hatta, öğretmen adaylarının aldıkları eğitim hizmetlerini geliştirmek ve iyileştirmek için gerçekleştirilecek girişimlerde, öğretmen adaylarının bakışaçılarına başvurmak daha da faydalı. Bu yüzden, bu çalışmanın amacı öğretmen adaylarının bakış açılarından öğrenme ve inovasyon becerileri üzerine olan kendi hazırbulunuşluk seviyelerinin incelenmesidir. Bu bağlamda, Türkiye'nin iç Anadolu bölgesinin kuzeybatısında yer alan bir devlet araştırma üniversitesinde okuyan son sınıf öğretmen adaylarına kendi öğretmen eğitimi programlarının onlara ne düzeyde 21. Yüzyıl öğrenme ve inovasyon becerileri ile ilişkili olan beceri göstergelerini kazanmalarına katkı sağladıklarını derecelendirmeleri istendi. Dolayısıyla, bu şekilde kapsamlı bir araştırma için, araştırma soruları aşaığaki gibi şekillendi.

Araştırma Soruları

1. Bir araştırma üniversitesindeki öğretmen adaylarının bakışaçılarından hangi göstergeler 21. Yüzyıl öğrenme ve inovasyon becerilerini açıklamaktadır?

2. Araştırma üniversitesinde verilen öğretmen eğitimi programları öğretmen adaylarının bakışaçılarından hangi düzeyde onları 21. Yüzyıl öğrenme ve inovasyon becerilerine sahip olmaya hazırlıyorlar?

3. Hazırbulunuşluk düzeylerinde cinsiyet ve öğretmen eğitimi bölümü bazında anlamlı farklılıklar var mı?

Alanyazın İncelemesi

Dünyada en kabul gören, en çok atıf alan ve en ünlü olan beceri çerçevesi 2002'de kurulan ve Amerika birleşik devletlerine ait ulusal bir organizasyon olan Partnership for 21st-Century Learning (P21) tarafından geliştirilmiştir. Bu organizasyon kendi beceri çerçevesini geliştirirken global yaklaşım ve akımlardan süregelen hayat boyu öğrenen bireyler yetiştirme odağını da benimsemesiyle, ve sürekli gelişen çerçevesi üzerine harcadığı emekler, hem geliştirme hem güncelleme yaklaşımlı yaptığı sürekli çalışmalar ve yayımladığı net dökümanlar ile bugünkü ününe diğer bütün alternatif 21. Yüzyıl beceri çerçeveleri arasından ulaşmıştır.

Mimari kemer tipi bir yapıya sahip bu çerçeve (Bkz. Figure 2.1) 21. Yüzyıl becerilerini üç net beceri kitinde toplamıştır. Çerçeve geliştirmeye olan genel kapsayıcı yaklaşımını göz önünde bulundurduğumuzda, bu organizasyon hayat ve kariyer beceri kiti ile hayat boyu öğrenen birey yetiştirmeye verdiği önemi ve adadığı vizyonu vurgulamasının yanı sıra, bilgi medya ve teknoloji beceri kiti ile bilgi ve iletişim teknolojileri üzerine ortaya çıkan becerileri de unutmamakadır. Dahası, bu organizasyon beceri çerçevesi için akıllıca seçtiği mimari kemer tipi yapı görselleştirmesi ile çerçevede yer alan üç beceri kitinin de önemini görsel olarak da iletmektedir. Bu bağlamda, daha önce bahsedilen beceri kitlerinden, hayat ve kariyer beceri kiti ve bilgi medya ve teknoloji beceri kiti bu mimari kemer tipi yapının üzengi

taşlarını oluştururken, geriye kalan öğrenme ve inovasyon beceri kiti ya da dünyaca 4C olarak da bilinen bu beceri seti ise bu yapının kilit taşı olarak simgelenmektedir. Bütün mimari kemer yapıyı bir arada tutma özelliğine de sahip bu kilit taşı ya da öğrenme ve inovasyon beceri kiti aşağıdaki gibi dört kapsayıcı beceriyi içermektedir:

1. Yaratıcılık ve inovasyon

2. Eleştirel düşünme ve problem çözme

3. İşbirliği

4. İletişim

Yaratıcılık ve inovasyon öğrenme ve inovasyon becerileri arasında yer almaktadır. Bunlar her zaman öğretmen eğitimi programları dahil tüm eğitim programlarının önemli kazanımları olarak görülmüştür (Griffin, McGaw, & Care, 2012). Yine de, bu becerilerin okul yolu ile aktarımı konusundaki endişeler hala devam etmektedir. Bu endişeler eğitim programlarının bütünüyle alakalı. İlk olarak, bu beceriler bireylerden bir seviyede otonomi sahibi olmalarını gerektiriyor ve dolayısıyla öğrenme ortamlarının bu otonomiyi engellememesi gerekli (Craft, 2003). Aksi halde, öğretmenler bu becerileri gençlere başarılı bir şekilde aktaramıyorlar (Westby & Dawson, 1995). Öğretmenlerin açısından ise bu becerilerin aktarımındaki problem biraz daha farklı. Bu kapsamda, Beghetto'nun (2007) söylediği gibi, kullandıkları eğitim programlarının sınırlılıklarına takılmadan, ya eğitimde ya da bu becerileri günlük hayatta kullanmada daha tecrübeli öğretmenler kendi derslerinde bu becerilerin öğrencilere aktarılmasında da daha başarılılar. Öte yandan, Beghetto (2007) yaratıcılık ve inovasyon becerileri üzerine tecrübesi az ve mesleğe yeni başlamış öğretmenlerin bahsedilen becerileri destekleyici etkinlikleri seçmemelerine olan yatkınlıklarının ve dolayısıyla belirli adımlar ve kesin cevaplar barındıran eğitici faaliyetleri tercih etmelerinin de bu becerilerin başarılı aktarımına engel olduğunun altını çizmiştir. Bunlar göz önünde bulundurulduğunda, okul döneminde bu becerilerin başarılı aktarımı en temelde belirli aksiyonları ve geliştirmeleri arz etmektedir: öğretmen

adaylarının üniversite eğitimleri sürecinde yaratıcılık ve inovasyon becerilerini arttırmak.

İçeriksel olarak problem çözmeyide kapsayan eleştirel düşünme çağdaş ve geleneksel eğitim programlarının tümünde yer alan temel becerilerin önemli bir unsuru olmuştur. Bu yüzyılda, eleştirel düşünme becerisinde uzmanlaşmanın önemi artan bir şekilde öğrenme ortamlarının sınırlarını aşarak hayatın tüm alanına yayılmıştır (National Education Association, 2014). Fakat, hala daha bireylerin iş sektörü ormanında hayatta kalma mücadelelerine geçmeden önce eleştirel düşünme becerilerinde uzmanlık kazanmaları için en iyi ortamlar okullar gibi öğrenme ortamlarıdır. Bu nedenle, eğitim fakülteleri de, bu becerinin okullarda öğretmenler tarafından gelecek nesillere başarılı bir şekilde aktarılabilmesi için, öğretmen adaylarına eleştirel düşünme becerisini aktarma sorumluluğunu taşımaktadır (Williams, 2005). Bu yüzden, öğretmen eğitimi programlarının öğretmen adaylarına bu beceriyi ne derece aktardığından ve onları bu becerileri aktarabilecek kişiler haline getirdiğinden emin olmak, öğretmen eğitimi araştırmacılarının önem vermesi gereken son derece önemli bir değerlendirmedir (Varga, 2011).

Bir beceri olarak işbirliği eğitim programlarının vazgeçilmez ve temel kazanımları arasında yer almıştır (Voogt & Roblin, 2012). Yine de, işbirliği kavramı yıllar boyunca iki ayrı bakış açısından algılanmıştır; ya bir öğrenme ve öğretme biçimi olarak ya da kendi başına bir beceri olarak (Lai, DiCerbo & Foltz, 2017). Öğrenme ortamlarındaki bu tarz bir yaklaşımın kendi başına bir beceri olan işbirliğinde ki gelişimi zorunlu olarak desteklemediği gerçeğine dayanarak (Le, Janssen & Wubbels, 2018), bir beceri olarak işbirliği eğitim programlarında belirgin bir ilgiye ihtiyaç duymaktadır çünkü okul yıllarında bu becerinin bireylerde gelişmemesi bireylerin iş alanları içinde ve dışında dezavantajlı olmaları ile sonuçlanmaktadır (Kuhn, 2015). Bu nedenle, okullarda bu becerinin başarılı aktarımı, ilk olarak öğretmen eğitimi programlarındaki geleceğin öğretmenlerinin bu beceriye sahip olmalarından geçmektedir. Ayrıca, okul ortamlarındaki öğretmen olarak profesyonel kariyerleri için de işbirliği becerisi son derece önemlidir (Gentry, 2012). Yine de işbirliği becerisinin öğretmen adaylarında

geliştirilmesi üzerine beklenen ve gerekli olan ilgi öğretmen eğitimi programlarında noksandır (Weiss, Pellegrino & Brigham, 2017). Bu yüzden, varolan öğretmen eğitimi programlarının ne düzeyde öğretmen adaylarına işbirliği becerilerini aktardığının değerlendirilmesi önemlidir.

İşbirliği gibi, iletişim de eğitim programlarının kazanımları arasında her daim kendisine yer buldu (Voogt & Roblin, 2012). Dahası, iletişim öğretmenlik mesleğinin har zaman nihai özelliklerinden biri oldu. Bu yüzden, öğretmen eğitimi programlarının iletişim becerisini aktarmadıklarını öne sürmek kesinlikle doğru olmaz (Hunt, Wright & Simonds, 2014). Yine de, hem bireylerin hemde toplumun bu becerinin aşağıdaki gibi faydalarından:

- Bireylere enerjik ve faydalı öz ve bireylerarası ilişkiler kurmalarında yardımcı olmak (Barker, 2006; Downing, 2005; Levine, 2005; McCracken, 2006),

- Bireyleri toplumlarda daha sosyal vatandaşlar haline getirmek (Berry, 2005; Du-Babcock, 2006; Scudder, 2004),

- Paylaşılan bilginin ve dolayısıyla öğrenmenin kalitesini arttırmak (Martin & Myers, 2006; Myers, Martin & Knapp, 2005),

daha fazla yararlanabilmesi için, öğretmenler iletişim becerilerine uzman seviyesinde sahip olmalılardır. Bu açıdan, akademiyenler sürekli olarak öğretmen eğitimi programlarının ne derecede öğretmen adaylarına öğretmenlik mesleğinin bu nihai özelliğini aktardığının değerlendirilmesi gerekliliğini dile getirmektedirler (Coggshall, 2007; Khan, Khan, Zia-Ul-Islam & Khan, 2017).

Neticede, öğretmenlerden beklenenler geçen yüzyıla nazaran hem değişti hemde arttı. Böylesine bir talepkar dönemde, maalesef, Darling-Hammond'ın (2006) söylediği gibi, tüm öğretmen eğitimi programları aynı seviyede 21. Yüzyılın gerekliliklerine, ihtiyaçlarına ve 21. Yüzyıldaki öğretmenlik mesleğine hazır bireyler yetiştiremiyorlar. Hatta, her bir beceri üzerinde alanyazında var olan öğretmen eğitimi seviyesindeki kavramsallaştırma ve seviye çalışmaları öğretmen adaylarındaki inkar

edilemez varyansı da doğrulamaktadır. Akademisyenlerin endişelerini ve ilgili alanyazındaki bulguları da göz önünde bulundurarak, bu çalışmanın amacı genel olarak öğretmen adaylarının bakış açılarından onların bu önemli beceri kiti üzerine olan hazırbulunuşluk seviyelerinin incelenmesidir.

Yöntem

Desen

Genel olarak öğretmen adaylarının bakış açılarından onların öğrenme ve inovasyon becerileri üzerine olan hazırbulunuşluk seviyelerini incelemeyi amaçlayan bu araştırma kesitsel tarama araştırması deseni ile yapılandırıldı. Veriler Türkiye'nin iç Anadolu bölgesinin kuzeybatısında yer alan bir devlet araştırma üniversitesinin eğitim fakültesinde okuyan son sınıf öğretmen adaylarından toplandı.

Örneklem

Genel olarak, bu çalışma için hedef kitle bir devlet araştırma üniversitesindeki eğitim fakültesinde okuyan tüm öğretmen adayları olarak tanımlandı. Fakat, hedef kitle eğitim fakültesine kayıtlı tüm son sınıf öğretmen adayları (N=345) olarak belirlendi. Böylesine bir konsantrasyonun arkasındaki neden ise çıkacak sonuçların genellenebilirliğini bir dereceye kadar yükseltmekti. Yani, genel yaklaşım öğretmen adaylarının görüşlerini kendi öğretmenlik eğitimi programları üzerine toplamak iken, son sınıf öğretmen adaylarına genel olarak kendi eğitim programlarını öğrenme ve innovasyon becerileri üzerine değerlendirmek diğer sınıflardaki öğretmen adaylarına değerlendirmekten daha mantıklıydı. Ayrıca bu şekilde, bulguların yorumlanmasının da daha doğru olacağı düşünüldü.

Bu çalışma ilk aşamasında öğrenme ve inovasyon becerilerinin öğretmen adayları bakışaçılarından açık uçlu sorulardan oluşan OHILIS isimli form ile belirlenmesini ve ikinci aşamasında birinci aşamadaki bulgular ile geliştirilmiş PLeSLIS isimli bir anket üzerinden öğretmen adaylarının aynı beceri seti üzerine olan hazırbulunuşluk seviyelerinin belirlenmesini içerdiği için, görünüşte farklı fakat bağlamsal olarak

benzer olan ve aynı kitleyi temsil eden iki örneklemi kapsamaktadır. İlk olarak, birinci aşama 2017-2018 akademik yılının bahar döneminin son iki haftasında eğitim fakültesinde okuyan 54 üçüncü sınıf öğretmen adayına uygulandı. Bu aşamanın asıl amacı ikinci aşamadaki PLeSLIS isimli anketi oluşturmak için öğretmen adaylarından yardım almaktı. PLeSLIS, 2018-2019 akademik yılının güz döneminin son iki haftasında aynı üniversitenin eğitim fakültesinde okuyan 206 son sınıf öğrencisine uygulandı. Yani, 2017-2018 akademik yılındaki 54 üçüncü sınıfta okuyan birinci aşamaya katılan katılımcıların teorik olarak 2018-2019 akademik yılında gerçekleştirilen ikinci aşamadaki veri toplama sürecinde yer almaları beklendi. İkinci aşamaya katılan sadece 1 kadın öğretmen adayı katılıma gönüllü olduktan ve PLeSLIS'in yarısını doldurduktan sonra çalışmaya devam etmek istemediğini belirtti ve anketin yarısını boş bıraktı. Dolayısıyla, bu cevap kağıdı analizden çıkartıldı ve toplamda 205 anket araştırmaya dahil edildi.

Veri Toplama Araçları

Bu araştırmada, birinci aşama için OHILIS isimli yönergeli bir form ve ikinci aşama için ise PLeSLIS isimli yönergeli bir anket araştırmacı tarafından araştırma sorularını yanıtlayabilmek için geliştirildi ve uygulandı. OHILIS, öğrenme ve inovasyon becerilerinin göstergelerini bulma formudur. PLeSLIS ise, öğrenme ve inovasyon becerileri üzerine hazırbulunuşluk seviyesi anketidir. Bu araçların yüzeysel, içeriksel ve yapısal geçerlilikleri uzman görüşleri alınarak, muhtemel katılımcılarla bilişsel görüşmeler yapılarak, ve veri toplama sonrasında açımlayıcı faktör analizi yapılarak sunulmuştur. Ayrıca, iç tutarlılık güvenilirliği, Cronbach Alpha değeri üzerinden .94 ve .78 arasında değişiklik göstermiştir.

Veri Toplama Süreci

Bu çalışma iki ardışık aşamadan oluşmaktadır. İlk aşamada, ilgili kontroller ve değişiklikler yapıldıktan sonra, OHILIS bir devlet araştırma üniversitesinin eğitim fakültesinde üçüncü sınıfta okuyan 54 katılımcıya kolayda örneklem yöntemi ile uygulandı. Veri toplayabilmek için, araştırmacı eğitim fakültesinde 2017-2018

akademik yılının bahar döneminde 3. Sınıf öğretmen adaylarına servis dersleri veren akademisyenlerle iletişime geçmiş ve derslerinde veri toplamak için izin istedi. Araştırmacı izin aldığı dersleri ziyaret ederek, öğretmen adaylarını detaylı bir şekilde araştırma konusunda bilgilendirip, katılımın gönüllülük esasına dayalı olduğunu hatırlatıp, soruların herhangi doğru bir cevabının olmadığını da vurguladıktan sonra, gönüllü katılımcılara anketi uygulayarak verileri topladı. OHILIS'in ortalama doldurulma süreci yaklaşık 15 dakika sürdü.

PLeSLIS geliştirildikten sonra, araştırma veri toplama araçları ile birlikte Orta Doğu Teknik Üniversitesi İnsan Araştırmaları Etik Kurulu'na etik kontrolü için teslim edildi. Araştırma önerisinin insan katılımcılarla araştırma yapma konusunda herhangi bir etik ihlali içermediğini savunan kurul, bu araştırmayla ilgili sorular ve öneriler için 2018-EGT-172 protokol numarasını atfetti.

Etik kurul izni sonrasında, PLeSLIS aynı devlet araştırma üniversitesinin eğitim fakültesinde son sınıfta okuyan 206 katılımcıya kolayda örneklem yöntemiyle uygulandı. Veri toplayabilmek için, araştırmacı eğitim fakültesinde 2018-2019 akademik yılının güz döneminde 4. Sınıf öğretmen adaylarına ders veren bölüm akademisyenleriyle iletişime geçti ve derslerinde veri toplamak için izin istedi. Araştırmacı izin aldığı dersleri ziyaret ederek, birinci aşamada olduğu gibi katılımcıları detaylı bilgilendirdikten sonra, gönüllü katılımcılara anketi uygulayarak verileri topladı. Sadece 1 kadın öğretmen adayı araştırmaya gönüllü olarak katıldıktan ve PLeSLIS'in yarısını doldurduktan sonra, devam etmek istemediğini belirtti ve yarısını boş bıraktı. Bu nedenle, incelemeye 205 katılımcının cevaplarıyla devam edildi. PLeSLIS'in ortalama doldurulma süreci yaklaşık 15 dakika sürdü.

Veri Analizleri

OHILIS ile, birinci araştırma sorusunu cevaplamak için 54 katılımcıdan nitel veriler toplanmıştır. Bu verilerin analizinde, tümevarımcı içerik analizi NVivo 12 analiz programının Öğrenci Deneme Sürümünde uygulanmıştır. 108 gösterge oluşturulmuş

ve bu göstergeler iki seviyeli sınıflandırmaya (genel-öğretimle ilgili ve yatkınlık-yetenek) tabi tutulmuştur.

PLeSLIS ile, geriye kalan araştırma sorularını cevaplamak için 206 katılımcıdan nicel veriler toplanmıştır. İkinci araştırma sorusunun veri analizinde betimsel istatistik kullanılırken, üçüncü araştırma sorusunun veri analizinde tek yönlü MANOVA çıkarımsal istatistik analizi ayrı ayrı hem cinsiyet hemde katılımcıların öğretmen eğitimi bölümleri için kullanılmıştır. Her iki analiz için de IBM SPSS V20 programının ODTÜ sürümü kullanılmıştır.

Araştırmanın Sınırlılıkları

Araştırma sınırlılıkları aşağıdaki gibidir:

- Tek bir üniversitede böylesine bir araştırmanın gerçekleştirilmesi, araştırmanın kapsamını ve bulguların ulusal genellenebilirliğini sınırlamaktadır.

- Gönüllülüğe dayalı katılım, katılımcıların daha olumlu cevaplar vermesine yolaçmış olabilir.

- Veri toplama sürecinde izin alınamayan derslerdeki öğretmen adayları, araştırmaya katılma şansı yakalayamamışlardır.

Diğer taraftan, 23 öğretmen adayı bu kadar uzun bir ankete katıldıktan sonra bile, PLeSLIS'in sonunda yer alan açık uçlu "öneri ve düşünceler" kısmını cevaplandırarak, katılımcıların katılım isteklerini göstermişlerdir.

Bulgular

Öğrenme ve İnovasyon Becerilerinin Göstergeleri

Yaratıcılık: öğretmen adayları bu becerinin altında hem inovasyon hemde problem çözme ile ilgili göstergeler de önermişlerdir. Yani, yaratıcı bir kişiliğin yaratıcılık

becerilerinin yanı sıra, hem inovasyon hemde problem çözme becerilerine de sahip olduğunu düşünmüşlerdir.

İnovasyon: İki öğretmen adayı açık bir şekilde inovasyon ya da inovatif/yenilikçi öğretmen terimini bilmediklerini belirtmişlerdir. Ayrıca, inovasyon göstergeleri, eğitime teknoloji entegrasyonu ve öz-gelişim sınırlarında önerilmiştir. Fakat, inovasyonun asıl tanımı; yaratıcı bir çözümün ya da ürünün başarıyla uygulanması ya da kullanılmasıdır (Amabile & Pillemer, 2012).

Eleştirel Düşünme: Bir öğretmen adayı açık bir şekilde eleştirel düşünme terimini bilmediğini belirtmiştir.

Problem Çözme: Bu becerinin göstergeleri bir öğretmenin bu beceriyi kullanması gerektiği durumlarda nasıl davranması gerekitiğine odaklanmış olarak önerildi. Genel olarak, öğretmen adaylarının bakış açılarından oluşturulan bu göstergelerde sistematik yaklaşım eksikliği bulundu.

Hazırbulunuşluk Seviyeleri

Öğrenme ve inovasyon becerileri ve katılımcıların bölümleri üzerine oluşturulan 8x5'lik matris üzerinden yapılan inceleme sonucunda, en düşük hazırbulunuşluk seviyesi yaratıcılık ve inovasyon becerisinin alt boyutu olan aykırı düşünme üzerinden Bilgisayar ve Öğretim Teknolojileri Eğitimi (BÖTE) bölümüne aitken, en yüksek hazırbulunuşluk seviyesi eleştirel düşünme ve problem çözme becerisinin alt boyutu olan oluşturma ve değerlendirme üzerinden Fen Bilgisi Eğitimi (FBE) bölümüne aittir. Hatta, tüm beceriler üzerinden en düşük seviyeler BÖTE'ye aittken, neredeyse tüm beceriler üzeride en yüksek seviyeler hep FBE'ye aittir. Bu durum sadece, aykırı düşünme üzerindeki en yüksek hazırbulunuşluk seviyesinin Okul Öncesi Eğitimine ait olması ile bozulmuştur.

Hazırbulunuşluk Seviyelerindeki Farklılık

Cinsiyet: Öğretmen adaylarının hazırbulunuşluk seviyelerinde cinsiyet bakımından anlamlı farklılıklar bulunmuştur. Bu bağlamda, kadın öğretmen adayları kendilerini erkek öğretmen adaylarından aykırı düşünme, ve oluşturma ve değerlendirme alanlarında daha hazır algılamaktadırlar.

Bölüm: Bölüm değişkeni öğretmen adaylarının hazırbulunuşluk seviyelerinde anlamlı düzeyde farklılık göstermemiştir.

Sonuç ve Öneriler

Öğrenme ve İnovasyon Becerilerinin Göstergeleri

Öğretmen adayları yaratıcılık becerisinin altında hem inovasyon hemde problem çözme ile ilgili göstergeler önermişlerdi. Bu bulgu, 21. Yüzyıl becerilerinin eş zamanlı kullanım özelliği ile açıklanabilir. Bu becerilerin kullanımı aynı anda diğer becerilerin kullanımını da beraberinde getirir (Collins, 2014; P21, 2015; Westera, 2001). Dolayısıyla, öğretmen adayları yaratıcılık becerisi göstergelerini yazarken aynı anda diğer iki beceriyi de düşünmüş olabilirler.

İki öğretmen adayı açık bir şekilde inovasyon ya da inovatif/yenilikçi öğretmen terimini bilmediklerini belirtmişlerdi. Bu bulgu, Bal-İncebacak, Sarışan-Tungaç, ve Yaman'ın (2018) bulgusuyla benzerlik göstermektedir. Araştırmacılar 121 öğretmenle yaptığı çalışmada yaklaşık 91 öğretmen adayının inovasyon terimini bilmediğini saptamıştı. Bu terim üzerindeki bilgi eksikliği öğretmen eğitimi sırasında çözülmelidir. Ayrıca, inovasyonun asıl tanımı; yaratıcı bir çözümün ya da ürünün başarıyla uygulanması ya da kullanılması (Amabile & Pillemer, 2012) iken, öğretmen adayları bakışaçılarından inovasyon göstergeleri, eğitime teknoloji entegrasyonu ve öz-gelişim sınırlarında önerilmişti. Bu bulgu ise, Budak ve Kayabaşı'nın (2018) sonuçlarıyla uyuşmaktadır. 36 eğitim bilimleri lisansüstü öğrencisiyle yürüttükleri çalışmada, katılımcılar inovasyonun tanımını teknoloji ve öz gelişimle ilişkilendirmişlerdir. Bu bulgular, eğitimde inovasyon olarak tanıtılan FATİH projesi gibi eğitim politikalarının

sonucundan kaynaklı kültürel bulgular olabilir. Bu tarz politikalara maruz kalan öğretmen adayları inovasyon terimini bu şekilde kavramsallaştırmış olabilirler. Terimin gerçek anlamının kazanımı için, öğretmen eğitimi programlarında öğretmen eğiticilerinin bu konuya da yer ve özen vermesi gereklidir.

Elli dört öğretmen adayından yanlızca 1'i açık olarak eleştirel düşünme terimini bilmediğini belirtmişti. Bu bulgu, Kanik'in (2010) öğretmenlerin eleştirel düşünmeyi kavramsallaştırmaları üzerine yaptığı çalışmasının bulgularıyla tutarlı denilebilir. Kanik'in (2010) çalışmasında bu terimi bilmeyen herhangi bir öğretmene rastlanmamıştır. Fakat, eleştirel düşünme gibi temel bir terimi bile bilmeyen öğretmenlik programı mezunu olma olasılığı endişe vericidir. Öğretmenlik eğitiminde bu terimin kavramsallaştırılması ve bu eksikliğin detayları gelecek çalışmalarda incelenmelidir.

Problem çözme becerisinin göstergeleri bir öğretmenin bu beceriyi kullanması gerektiği durumlarda nasıl davranması gerekitiğine odaklanmış olarak öğretmen adayları tarafından önerilmişti. Genel olarak, öğretmen adaylarının bakış açılarından oluşturulan bu göstergelerde sistematik yaklaşım eksikliği bulunmuştu. Bu bulgu, Son ve Lee'nin (2016) sonuçlarıyla benzerlik göstermektedir. Bu araştırmacılar da, öğretmen adaylarında problem çözme üzerine sistematik yaklaşım eksikliğine rastlamışlardır. Sonuç olarak, bu problemin nedenleri gelecek çalışmalarda incelenmeli ve problem çözme yöntemleri üzerine öğretmen adayları bilgilendirilmelidir.

Hazırbulunuşluk Seviyeleri

Öğrenme ve inovasyon becerileri ve katılımcıların bölümleri üzerine oluşturulan 8x5'lik matris üzerinden yapılan inceleme sonucunda, en düşük hazırbulunuşluk seviyesi yaratıcılık ve inovasyon becerisinin alt boyutu olan aykırı düşünme üzerinden Bilgisayar ve Öğretim Teknolojileri Eğitimi (BÖTE) bölümüne ait çıkmıştır. Bu bulgu, Temizkalp'in (2010) öğretmen adaylarının yaratıcılık seviyeleri üzerine yaptığı çalışmasının sonuçları ile benzerlik göstermektedir. Araştırmacı, aykırı düşünmeye

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benzer olan ayrıntılandırma boyutunda BÖTE'nin diğer bölümler arasında en düşük seviyeye sahip olduğunu bulmuştur.

Öte yandan, bu çalışmada en yüksek hazırbulunuşluk seviyesi eleştirel düşünme ve problem çözme becerisinin alt boyutu olan oluşturma ve değerlendirme üzerinden Fen Bilgisi Eğitimi (FBE) bölümüne ait bulunmuştur. Bu bulgu ise, Erdem ve Yazıcıoğlu'nun (2015) çalışmasında aynı bölümün eleştirel düşünme yatkınlığı üzerinden en yüksek yatkınlığa sahip olması ile benzerlik göstermektedir. Fakat bu çalışma bir tarama çalışması olduğu için, bu bulguların nedenlerini verememektedir. Bu nedenle, gelecek çalışmalar bu bulguların nedenlerini detaylı olarak nitel araştırma yöntemlerini kullanarak araştırabilir.

Tüm beceriler üzerinden en düşük hazırbulunuşluk seviyeleri BÖTE'ye, neredeyse tüm beceriler üzeride en yüksek seviyeler hep FBE'ye ait bulunmuştu. Bu durum sadece, aykırı düşünme üzerindeki en yüksek hazırbulunuşluk seviyesinin Okul Öncesi Eğitimine ait olması ile bozulmuştu. Bu bulgu, Temizkalp'in (2010) çalışmasında da, diğer bölümler arasından Okul Öncesi Eğitiminin yaratıcılıkta en yüksek seviyeye sahip olması ile tutarlıdır. Bu durum, bu bölümün programında yer alan ve zorunlu ders olan yaratıcılık ve çocuk dersinden kaynaklı olabilir. Hatta, Dere (2017) çalışmasında bu dersin öğretmen adaylarının yaratıcılık seviyelerinde anlamlı bir fark oluşturacak şekilde etkili olduğunu da saptamıştır. Bu tarz dersler, eğitim fakültelerinde seçmeli ya da zorunlu olarak diğer öğretmenlik bölümlerine de verilerek bölümlerarası hazırbulunuşluk seviyelerinde varyasyon azaltılabilir.

Hazırbulunuşluk Seviyelerindeki Farklılık

Öğretmen adaylarının hazırbulunuşluk seviyelerinde cinsiyet bakımından anlamlı farklılıklar bulunmuştur. İlk olarak, kadın öğretmen adayları kendilerini erkek öğretmen adaylarından aykırı düşünme alanında daha hazır algılamaktadırlar. Bu sonuç, Temizkalp (2010) ve Kaufman'ın (2006) çalışmaları ile tutarlı iken, Topoğlu'nun (2015) çalışması ile tutarsızdır. Temizkalp'in (2010) araştırmasında kadın öğretmen adayları yaratıcılığın alt boyutu olan ve aykırı düşünmeye benzeyen

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ayrıntılandırma boyutunda erkeklerden anlamlı düzeyde daha yüksek seviyelere sahip olduğunu göstermektedir. Kaufman'ın (2006) çalışması kadınların öğretmenlik mesleğinde kendilerini erkeklerden anlamlı düzeyde daha yaratıcı algıladıklarını kanıtlamıştır. Diğer yandan, Topoğlu'nun (2015) çalışmasında cinsiyete göre yaratıcılıkta anlamlı fark bulunmamıştır.

Ayrıca, bu araştırmanın bulgularına göre, kadın öğretmen adayları kendilerini erkek öğretmen adaylarından eleştirel düşünme ve problem çözmenin alt alanı olan oluşturma ve değerlendirme alanında daha hazır algılamaktadırlar. Alanyazındaki çalışmalardan Demiral (2018) ve Kutluca'nın (2018) çalışmaları cinsiyete göre bu beceride anlamlı farklılığa rastlamamıştır. Öte yandan, Erdem ve Yazıcıoğlu'nun (2015) araştırması erkeklerin eleştirel düşünmeye olan yatkınlıklarının kadınlardan anlamlı düzeyda daha fazla olduğunu öne sürerken, Çetinkaya (2011) ve Gülveren'in (2007) araştırmaları kadın öğretmen adaylarının hem eleştirel düşünme yatkınlıklarının hemde eleştirel düşünme beceri seviyelerinin erkeklerden anlamlı düzeyde daha yüksek olduğunu bulmuştur. Bu bağlamda, bu çalışmanın bulguları, Çetinkaya (2011) ve Gülveren'in (2007) bulguları ile uyuşmaktadır.

Son olarak, bu çalışmada bölüm değişkeni öğretmen adaylarının hazırbulunuşluk seviyelerinde anlamlı düzeyde farklılık göstermemiştir. Bu bulgu, alanyazındaki bazı çalışmalar (Gülveren, 2007; Kutluca, 2018; Örün, Orhan, Dönmez, & Kurt, 2015; Tan & Tan, 2016; Topoğlu, 2015; Yiğitcan-Nayir & Tekmen, 2017) ile tutarlılık göstermektedir.

Uygulamaya Dönük Çıkarımlar

Öğretmen eğitimi programları hızlı bir şekilde eyleme geçerek hem öğretmen adaylarının 21. Yüzyıl becerilerini de kapsayan eğitimde 21. Yüzyıl akımı üzerine bilgilerini hemde program içi ve program dışı etkinlikler ile öğretmen adaylarının bu beceriler üzerine tecrübelerini arttırmaları gerekmektedir. İlk olarak, bilgi arttırımı için öğretmen adaylarına 21. Yüzyıl akımını ve becerilerini anlatan, bu becerilerin günlük hayatta kullanımını ve nasıl gelecek nesile aktarılabileceğini anlatan bilgilendirici

seminerler verilmesi önerilmektedir. Tecrübe arttırımı için ise, öğretmen eğitimi programlarında daha fazla etkileşimli etkinlik fırsatları öğrenme ve öğretme etkinlikleri olarak öğretmen adaylarına sunulmalıdır. Örnek olarak, öğrenme ve inovasyon becerilerinden her biri için oyun, drama, atölye çalışması ve ya genel etkinlikler düzenlenebilir. Bu önerileri öğretmen eğitimi bölümleri kendi başlarına ya da ortak olarak gerçekleştirebilirler. Bu öneriler uygulandığında, bu araştırmada ortaya çıkan farklılıklar da ortadan kalkabilir ya da azaltılabilir.

Araştırmaya Dönük Çıkarımlar

Bu araştırmadan, ileride yapılacak araştırmalara yönelik çıkarımlar aşağıdaki gibidir:

- Aynı veri toplama araçları kullanılarak ve 2021-2022 akademik yılında da veri toplanarak, 2018-2019 yılında yürürlüğe girmiş olan yeni öğretmen yetiştirme programı politikasının etkisi değerlendirilebilir.

- Bu çalışmanın nitel versiyonu yürütülebilir.

- Öğretmen adaylarının bu beceriler üzerine beceri seviyeleri ölçülebilir.

- Öğretmen adaylarının hazırbulunuşluk seviyeleri farklı bakışaçılarından ele alınabilir. Örneğin, öğretmen eğitimcilerinin bakışaçılarından öğretmen adaylarının hazırbulunuşluk seviyeleri incelenebilir.

- Nitel çalışmalarla öğretmen adaylarının öğrenme ve inovasyon becerilerinin terimlerindeki bilgi eksiklikleri araştırılabilir.

- Bilgisayar ve Öğretim Teknolojileri Eğitimi'nin tüm hazırbulunuşluk seviyelerinde düşük, Fen Bilgisi Eğitiminin ise yüksek çıkmasının nedenleri detaylı olarak nitel çalışmalar ile araştırılabilir.

- Kadın öğretmen adaylarının neden aykırı düşünme ve oluşturma ve değerlendirme alanlarında kendilerini erkeklerden anlamlı düzeyde daha hazırbuldukları ileride yapılacak araştırmalarda incelenebilir.

- Bu çalışmada, cinsiyet ve bölüm değişkenleri incelenmiştir. Öğretmen adaylarının önceki eğitim hayatlarının etkisini incelemek için, mezun olunan lise türü de bu değişkenler arasına eklenebilir.

- Bu çalışmada, sadece son sınıf öğretmen adaylarının hazırbulunuşluk seviyeleri incelenmiştir. 4 yıllık eğitim veren bu fakültelerdeki tüm öğretmen adaylarıyla benzer çalışma yapıldığında, sınıf seviyesinin etkisi de incelenebilir.

Appendix F: Thesis Permission Form / Tez İzin Formu

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Bölümü / Department   : EĞİTİM PROGRAMLARI VE ÖĞRETİM

TEZİN ADI / TITLE OF THE THESIS (**İngilizce** / English) : A STUDY OF PRESERVICE TEACHERS

PERCEPTIONS OF THEIR PREPAREDNESS LEVELS ON LEARNING AND INNOVATION SKILLS IN A

RESEARCH UNIVERSITY

TEZİN TÜRÜ / DEGREE**:** **Yüksek Lisans** / Master ■   **Doktora** / PhD ☐

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