# THE RELATIONSHIP BETWEEN PRESERVICE TEACHERS' PERCEPTIONS TOWARDS THE USE OF ICT INTEGRATION IN TEACHER EDUCATION AND DIGITAL GAME-BASED LEARNING

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## ABSTRACT

THE RELATIONSHIP BETWEEN PRESERVICE TEACHERS' PERCEPTIONS TOWARDS THE USE OF ICT INTEGRATION IN TEACHER EDUCATION AND DIGITAL GAME-BASED LEARNING

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The purpose of this study was to explain the relationship between pre-service teachers' perception of ICT strategies used in teacher education programs to prepare pre-service teachers for technology integration and the perception of DGBL. In addition, the perception of DGBL was examined with four dimensions: experience, attitude, self-efficacy and perception. The participants were 306 3rd and 4th year pre-service teachers who were students in Ankara, Turkey. Data were collected with the Digital Game Supported Learning (DGSL) Scale and Synthesis of Qualitative Evidence (SQD) Scale. DGSL Scale was adapted to the Turkish language for the purpose of this study. After conducting exploratory and confirmatory factor analyses, descriptive statistics were examined. Additionally, three separate linear regression analyses were carried out to test the predictive relationship between SQD and the three subscales of DGSL, namely perception, attitude, and self-efficacy.

The findings of the analyses demonstrated that the participants' perception of ICT strategies used in teacher training programs had a significant relationship with the attitude, self-efficacy, and perceptions of DGBL. In other words, the more the ICT strategies defined in the SQD model were included in teacher education programs, the more levels of preservice teachers' perceptions of DGBL increased. Additionally, analysis of regression analyses revealed that the pre-service teachers' perception of DGBL was the variable that was positively and the most significantly associated with the perception of ICT strategies.

**Keywords**: ICT in Education, Digital Game-enhanced Learning, Attitude towards Digital Games, Digital Gaming Self-efficacy, Digital Gaming Experience

# ÖZ

ÖĞRETMEN ADAYLARININ ÖĞRETMEN EĞİTİMİNDE BİLGİ VE İLETİŞİM TEKNOLOJİLERİ ENTEGRASYONUNUN KULLANIMI İLE DİJİTAL OYUN TEMELLİ ÖĞRENME ALGILARI ARASINDAKİ İLİŞKİ

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Bu çalışmanın amacı, öğretmen adaylarının, onları teknoloji entegrasyonuna hazırlamak için öğretmen yetiştirme programlarında kullanılan bilgi ve iletişim teknolojileri stratejilerine ilişkin algıları ile dijital oyun temelli öğrenme algıları arasındaki ilişkiyi açıklamaktır. Ayrıca dijital oyun temelli eğitim algısı deneyim, tutum, öz yeterlik ve algı olmak üzere dört boyutta incelenmiştir. Katılımcılar Ankara ilinde öğrenim gören 306 tane 3. ve 4. sınıf öğretmen adayından oluşmaktadır. Veriler, Dijital Oyun Destekli Öğrenme Ölçeği ve Nitel Kanıt Sentezi Ölçeği ile toplanmıştır. Dijital Oyun Destekli Öğrenme Ölçeği bu çalışmanın amacı doğrultusunda Türkçe'ye uyarlanmıştır. Açımlayıcı ve doğrulayıcı faktör analizleri yapıldıktan sonra tanımlayıcı istatistikler incelenmiştir. Ek olarak, öğretmen adaylarının, öğretmen yetiştirme programlarında bilgi ve iletişim teknolojileri stratejilerinin kullanımına yönelik algıları ile Dijital Oyun Temelli Öğretim ölçeğinin üç alt boyutu olan algı, tutum ve öz-yeterlik arasındaki yordayıcı ilişkiyi test etmek için üç ayrı doğrusal regresyon analizi yapılmıştır.

Analizlerin bulguları, katılımcıların öğretmen yetiştirme programlarında kullanılan bilgi ve iletişim teknolojileri stratejilerine ilişkin algılarının, dijital oyun temelli öğrenmeye yönelik tutum, öz-yeterlik ve algıları ile anlamlı bir ilişkisi olduğunu göstermiştir. Başka bir deyişle, Nitel Kanıt Sentezi modelinde tanımlanan bilgi ve iletişim teknolojileri stratejileri öğretmen yetiştirme programlarında ne kadar çok yer alırsa, öğretmen adaylarının dijital oyun temelli öğrenmeye yönelik algıları da o kadar yükseleceği görülmüştür. Ayrıca, regresyon analizlerinin sonuçları, öğretmen adaylarının dijital oyun temelli öğrenmeye yönelik algısının, bilgi ve iletişim teknolojileri stratejileri algısı ile pozitif ve en anlamlı ilişkili olan değişken olduğunu ortaya koymuştur.

**Anahtar Kelimeler**: Eğitimde Bilgi ve İletişim Teknolojileri, Dijital Oyun Temelli Öğrenme, Dijital Oyunlara Yönelik Tutum, Dijital Oyun Öz-yeterliliği, Dijital Oyun Deneyimi

*To my family who always*
*believes in me and supports my dreams*
*in every way possible*

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## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

## LIST OF ABBREVIATIONS

ICT: Information and Communication Technology

IT: Information Technology

DGBL: Digital Game-Based Learning

COTS: Commercial Off-the-Shelf Games

SQD: Synthesis of Qualitative Evidence

TPACK: Technological pedagogical content knowledge

EFA: Exploratory factor analysis

CFA: Confirmatory Factor Analysis

ANOVA: Analysis of Variance

# CHAPTER 1

# INTRODUCTION

This introductory chapter aims to present background information about the study including four different sections. The first section provides essential information about the background of the study, and the second section explains what the purpose of the study is. Then the third part gives detailed information about the significance of the study considering the relevant literature. The final section of this chapter gives definitions of important terms mentioned in the study.

## 1.1. Background of the study

Improvements in technology and digital games have directly affected the daily lives of children and remarkably reshaped the educational contexts in schools with the idea that conventional teaching methods are not sufficient to meet the learning needs of the gamer generation (Chmielarz & Szumski, 2019; Rajić & Tasevska, 2019; Reynolds & Anderson, 2015; Seralidou & Douligeris, 2020; Shadiev et al., 2018; Vargas-Macías et al., 2020). Additionally, children of the 21st century need to acquire some qualifications such as critical and creative thinking, cooperating, technology literacy, and self-sufficiency (Chu et al., 2016) in comparison with the idea of students' being only passive receivers of information in traditional ways of learning and getting knowledge from an authority that causes students to lose their attention and reduces their achievement in the progress of time (Chang et al., 2019). Since technology and digital games doubtlessly captivate digital natives, who are the students of this era, more than any other way of learning to acquire knowledge (Zulkiply & Abd Aziz, 2019), including instructional technologies and digital games in educational programs

has become prominent (Ashrafzadeh & Sayadian, 2015; Ishak et al., 2021; Sipos & Bodnar, 2021; Tandiono, 2021; Zou et al., 2019).

Information and communication technology (ICT) is an umbrella term for Information technology (IT) that is composed of all communication technologies, services, and applications to acquire, collect, create, and share information with other people. ICT is also used to improve the feasibility of knowledge acquisition, promote education quality via various approaches, and advance the learning process in educational contexts (UNESCO, 2009). Moreover, since they are the key points of the ICT integration process as the agents who will carry out the ICT integration in the classes, they should improve their skills to implement ICT strategies during the teaching process in the future (Almerich et al., 2016; Becker et al., 2017; Cuhadar, 2018; Teo, 2015). For the implementation of effective ICT integration in education, teachers of the future should be prepared as well-developed and competent teachers (Turan & Göktaş, 2018) with the belief of including technology makes a huge improvement in promoting the learning process (Aslan & Zhu, 2018). Even if preservice teachers are capable of using technologies in their daily lives with different purposes, utilization of ICT for educational purposes in the schools is not as high as anticipated, and it is one of the other essential reasons why preservice teachers should get training about ICT integration (Albion et al., 2015; Gill et al., 2015). However, like any other innovation in educational contexts, benefiting from ICT for instructional purposes also requires some time. Hence, prospective teachers of this generation should receive training about how they can enlighten students with different ways of using ICT because contrary to being only users of technology, being a teacher who is benefiting from technology for educational purposes is something quite new for them (Mouza et al., 2014). Furthermore, when they become teachers, they should be competent enough to integrate technology into their lessons based on the schools' present and future circumstances and the needs of the society (Kaufman, 2015).

When the recent literature is reviewed in detail, with the importance of technology in our daily lives and the needs of this generation, it has also become compulsory to teach effective technology use in teacher education programs because preservice teachers are required to know how they can adequately include technology in their future

lessons (Akhwani, 2019; Blaj-Ward & Winter, 2019; Dingli & Seychell, 2016; Drummond & Sweeney, 2017; Hamilton, 2018; Judd, 2018; Hirschman & Wood, 2020; Rozhkova, 2020; Solas & Sutton, 2018; Smith et al., 2020; Srivastava & Dey, 2018; Szymkowiak et al., 2021; Tran et al., 2020). Consequently, there is a consensus among the studies that preservice teachers should be taught in teacher training programs about how they can use ICT for educational purposes in the future (Brun & Hinostroza; 2014, Kaufman, 2015; Sun et al., 2017; Tondeur, 2018). Hence, several changes were made in the programs of teacher education institutions to increase pre-service teachers' awareness of technology integration and to enable them to see how technology supports learning from a pedagogical perspective (Ottenbreit-Leftwich et al., 2010; Polly et al., 2010; Tømte et al., 2015).

According to some studies, preservice teachers' using ICT strategies is directly associated with how much and how well they can experience learning and teaching with technology integration throughout their education (Agyei & Voogt, 2011; Tondeur et al., 2012). Therefore, pre-service teachers should be given an opportunity to acquire an understanding of the pedagogical value of technology use in education as well as develop their technology literacy skills and subject matter knowledge (Koehler & Mishra, 2009). Moreover, the main point of the studies about preservice teachers' using ICT strategies is not limited to having knowledge about technology or how to use it in their daily lives, these studies also reveal the importance of including technology for both learning and teaching as a pedagogical approach (Tondeur et al., 2012).

Since pre-service teachers' perceptions towards the use of ICT integration are so important to implement it in the future, the way they get their education about technology fulfillment is also noteworthy. Hence, the curriculums of the schools change depending on the needs of the digital age (Starkey, 2016), and the requirement for new teaching methods, sources, equipment, and approaches cannot be denied (Lips et al., 2017). According to Akarawang et al. (2015), training that preservice teachers get about ICT integration in teacher education programs should be more feasible and efficient rather than being theory-focused by including constructivist approaches and techniques like flipped learning. However, instead of ICT-based instruction, most of

the preservice teachers only have a chance to experience ICT integration as a learning aid in a part of the traditional learning process (Cuhadar, 2018). Hence, teacher education programs require a better plan to develop preservice teachers' use of ICT in the future (Baran et al., 2013). However, various strategies are also engaged in teacher education programs to improve preservice teachers' ICT use in the future (Tondeur, 2018). Accordingly, Tondeur et al. (2012) developed an overarching synthesis of qualitative evidence (SQD) model by examining the literature with the aim of combining best strategies of using ICT in educational contexts. The figure of the SQD model is a circle with four layers. While two inner circles (collaboration, authentic experiences, feedback, role models, reflection, and instructional design) are about the micro-level strategies, two outward circles (access to resources, technology planning and leadership, cooperation within and between the institutions, and training staff) are about strategies that are at institutional levels. Nevertheless, none of the strategies used to promote ICT use in education should be taught independently from each other as the relationship among the strategies is also an essential part of using these strategies (Tondeur, 2018).

Digital Game-Based Learning (DGBL) encompasses combining educational goals, technology, assessment, and entertainment into a digital game with the aim of promoting learning and student engagement (Daniela, 2020; Hung et al. 2018; Kaimara, & Deliyannis, 2019; Ke, 2016; Nussbaum & Beserra, 2014, Zulkiply & Abd Aziz, 2019). It can be said that harmony between components of education and games constitutes DGBL (Bellotti et al., 2013), and two different kinds of games can be preferred to implement DGBL in the classroom. While serious games are designed with the aim of educational benefits, Commercial-Off-The-Shelf games are introduced to the market only for fun purposes, but they can also be utilized for teaching in schools with proper adjustments (Becker, 2016; Reinhardt, 2017; Stewart et al., 2013; Van Eck, 2009).

One of the goals of DGBL is also to minimize the potential problems for the learning process by reducing anxiety, motivating students, providing high interaction with students, and being aware of the mental burdens (Sung & Hwang, 2013; Yang et al., 2016; Yükseltürk et al., 2018). Digital games contain different kinds of games that can

be played via various technological devices (All et al., 2016), and they create a stress-free simulated world that students can take advantage of the subject matter knowledge they acquire in their lessons by doing exercises without having any fear of making mistakes. Particularly, contrary to traditional methods, digital games are really entertaining and arouse students' interest while they are learning something new (Simpson & Stansberry, 2008).

Depending on their educational goals, there are three different kinds of special-purpose games. These games are related to consequences of cognitive learning, skill-based learning, and behavioral change (Stewart et al., 2013). While games associated with cognitive learning outcomes intend to transmit information such as teaching a language or teaching physics, games want to have some skill outcomes are used to promote skill obtainment specifically used by private sector companies (Kretschmann, 2012). The games that aim to change behavior or attitude are generally designed to change behaviors of a big group of people about something important for a country or the whole world such as issues about health or economy. On the other hand, it does not mean that DGBL should be limited to only one special purpose because a digital game can have an influence on both cognitive learning outcomes and at the same time it may lead to a behavior change. That is to say, while a student learns important historical events thanks to a digital game, he/she can also start to have a positive attitude towards the history lesson (Stewart et al., 2013).

With the changes mentioned above, one of the aims of teacher education programs is to support technology use and DGBL by ensuring preservice teachers have constructive attitudes towards it because any alteration in education is directly and closely connected with the teachers since they are the key point of the learning and teaching process (Bell & Gresalfi, 2017). It was also revealed by the studies of Martin-del-Pozo et al. (2019) and Hebert et al. (2021) that the attitude of teachers is one of the main elements that have an effect on technology use and DGBL implementation in the classroom with an influence on the motivation of students to learn with it. Hence, depending on teachers' attitudes, possible barriers to use DGBL is a substantial issue that should be investigated to give them the opportunity to improve their way of using DGBL. However, the literature also displays that the number of teachers who get an

education about using DGBL efficiently in their classes is very low (Brooks et al., 2021; Charlier & De Fraine, 2012; Eckenroth, 2021; Hussein et al., 2021; Nieland et al., 2021) According to a study conducted by Takeuchi and Vaala (2014), only a small group of teachers using digital games in their lessons experienced DGBL in their teacher education programs. The rest of the teachers acquired knowledge about DGBL thanks to different methods like tutoring, courses, or self-learning. On the other hand, if teachers are given enough training about using new teaching methods, their opinions are more likely to be open to change during the advancement (Spiteri & Rundgren, 2018) That is to say, teachers with different times of experience have different attitudes and motivations towards to integration of DGBL into practice (Koh et al., 2012) because every level of career steps are determined by particular behaviors, attitudes, and improvement needs (Oplatka & Tako, 2009).

The center of attention of DGBL literature is mostly about the efficiency of DGBL and its effect on student success determined via factors such as motivation, attainment of information, and other skills (Proctor & Marks, 2013). However, considering the importance of teachers' role in using technology in education and implementing DGBL, it is very significant to understand their perspectives (Akkaya et al., 2021; Kaimara et al., 2021) but there are just a few studies regarding the perceptions of teachers about using ICT strategies and DGBL in educational contexts (Casillas Martín et al., 2019; Koh et al., 2012; An et al., 2016; Denham et al. 2016; Gaudelli & Taylor, 2011) so that little is known about the relationship between them. Consequently, there is a continuous requirement to investigate and improve the utilization of ICT strategies and DGBL as a part of the professional progress of preservice teachers. In brief, it is crucial to examine the perspectives of teacher candidates about technology and digital games to promote students' learning.

### 1.2. Purpose of the study

The aim of this study is to investigate the relationship between pre-service teachers' perceptions about the strategies used in teacher education to facilitate ICT integration and their perceptions about digital game-based learning from several variables defined as (1) perceptions of the ICT strategies used in teacher education to facilitate

technology integration, (2) digital gaming experience, (3) attitudes toward digital gaming, (4) digital gaming self-efficacy, (5) perceptions of DGBL.

### 1.3. Significance of the study

Today, technology is used from all walks of society in various forms with many different purposes (Younes & Al-Zoubi, 2015). Therefore, technology and digital games have gained an undeniably important place as a part of children's daily lives (Danby et al., 2018; Graafland, 2018; Johnston et al., 2018; Orlando, 2021; Robinson, 2021), and the effects of technological developments have begun to be seen in the field of education as well (Allcoat et al., 2021; Ghory & Ghafory, 2021; Oliveira & Souza, 2021; Raja & Nagasubramani, 2018). Since teachers are the heart of the learning process, it has become inevitable to prepare preservice teachers to use ICT strategies and DGBL effectively (Tondeur et al., 2012; Williams et al., 2009). Hence, this study intended to examine the relationship between preservice teachers' perceptions of using ICT strategies and DGBL.

Even if some studies examined the strategies used in teacher education to facilitate technology integration (Baran et al., 2017; Kay, 2006; Ruggiero & Mong, 2015; Slechtova, 2015; Tondeur et al., 2016), the success and effectiveness of DGBL (All et al., 2021; Behnamnia et al., 2020; Xu et al., 2019; Yeh et al., 2017; Zulkiply & Abd Aziz, 2019), and perceptions of teachers (Akkaya et al., 2021; Hayak & Avidov-Ungar, 2020; Hsu & Chiou,2019; Uluay & Dogan, 2016), there are a few studies examining the relationship between preservice teachers' perceptions of using ICT strategies and DGBL (An, 2018; Dele-Ajayi et al., 2019; Maher, 2020).

Moreover, reviewing the present literature showed that there is an inadequacy in teacher education programs concerning integrating technology and digital games into learning processes (An, 2018; Groff, 2018; Meredith, 2016). The education that preservice teachers received during their undergraduate education is reported to be inadequate in terms of facilitating the use of digital games with educational concerns (Denham, 2019; Takeuchi & Vaala, 2014). Hence, the study searched for an answer to find out what were the perceptions of preservice teachers about using ICT strategies and relating them with new teaching methods such as DGBL in the classrooms. The

findings of this study intend to contribute to the ongoing research about technology integration in education and DGBL. Moreover, in line with the needs of the growing new generation who are called digital natives, it is essential to show the importance of preservice teachers' perceptions about the use of technology and DGBL since they are the key points of the teaching process (Gibson et al., 2007). Understanding per-service teachers' perspectives may assist the progress of better advances associated with the planning of sources, providing infrastructure, and development of curriculum (Teo, 2015).

Furthermore, the quantity and quality of technological experiences that pre-service teachers have as part of their teacher preparation programs is a significant determinant in determining how quickly new teachers accept technology (Agyei & Voogt, 2011). In order to develop a positive attitude, improve their level of self-efficacy, and have positive perception about including digital games as an instructional method, pre-service teachers should be provided necessary education throughout their university life so that being more exposed to use different kinds of technology integration strategies can increase the possibility of using it in the future (Goktas et al., 2008; Tondeur et al., 2012). In parallel with this idea, teacher education programs should provide education about the useful ICT strategies that can be helpful in the future. In this study, six of the techniques to improve technology integration skills included that seen as crucial strategies of technology use. First of these strategies was about the importance of suitable role models for pre-service teachers since they also learn as anyone else from the people around them and they tend to act like people they take as an example. Also taking feedbacks from their role models, studying collaboratively with their friends, having chance to reflect on their own progress are among the other strategies. Moreover, if pre-service teachers are given opportunity to provide their own materials or lesson plans, then have time to implement these in real environments to get experiences their perceptions of effective technology use can be changed in a postive way since they take advantage of these strategies (Tondeur et al., 2016). Hence, with this study the importance of the most efficient methods to promote the inclusion of technology in the classrooms can be enlightened and the importance of their relationship with perceptions of DGBL can be seen since the primary factor of including any new technological method or instructional tool directly connected with

the technology integration skills (Hébert et al., 2021; Hayak & Avidov- Ungar, 2020; Kaimara et al., 2021; Uluay & Doğan, 2020).

Considering all these together, this study aimed to contribute to the literature by examining the relationship between preservice teachers' perceptions of using ICT strategies in teacher education programs and DGBL. In addition, the scale used in this study was adapted to Turkish to benefit its purposes. This study will also provide information about the four dimensions that affect the perceptions of preservice teachers towards DGBL including digital gaming experience, attitudes toward digital gaming, digital gaming self-efficacy, and perceptions of DGBL and will give an opportunity to DGBL to be a suitable and useful means of instruction as well as perceptions of the strategies used in teacher education to facilitate technology integration. In short, this study will contribute to the literature by creating awareness about how preservice teachers see DGBL and if they prefer to use it in the future as an educational tool or not. In addition, this study can be a good starting point for other researchers who are stakeholders in educational contexts.

### 1.4. Definition of Important Terms

*Digital games*: Digital games refers to the games that need to be played via any kind of technological device such as computers, tablets, consoles, mobile phones, and so on (Kerr, 2006).

*Serious games*: Serious games are games that are used to promote teaching and practice rather than being only for amusement (Michael & Chen, 2006).

*Digital game-based learning*: Digital game-based learning is a method or approach that contains the integration of digital games as a pedagogical tool (Prensky, 2001; Van Eck, 2006).

*Information and Communication Technology (ICT)*: Information and Communication Technology is a general term that contains all communication technologies to obtain, gather, transform, share, and reveal information (Yusuf & Yusuf, 2009).

*Commercial Off-the-Shelf Games (COTS)*: Commercial Off-the-Shelf Games are digital games that can be bought and played for amusement purposes without educational concerns, they are just designed to entertain people (Reinhardt & Sykes, 2012).

*Attitude*: Attitude involves cognitive, affective, and behavioral constituents that are related to the knowledge, evaluation, and inclination to react to the objects (Thurstone, 1931; Wagner,1969)

*Self-efficacy*: Self-efficacy refers to specific beliefs that decide how properly a person can accomplish a task in potential circumstances (Bandura, 1977; Bandura, 1997).

*Digital gaming self-efficacy*: Digital gaming self-efficacy refers to the beliefs of people that they can accomplish whatever their goal in the game is while playing it enthusiastically (Hsu & Chiou, 2019).

# CHAPTER 2

# REVIEW OF LITERATURE

## 2.1. ICT Integration in Teacher Education

With the improvements in it, technology has become an inseparable part of our lives, concordantly, the importance of making use of technology at school has increased (Dolenc & Aberšek, 2015; Robinson & Aronica, 2015). Therefore, instructional programs have begun to be affected by computer-based exercises or assignments, improvement of technology, and various technologies that can be used for educational purposes (Ashrafzadeh & Sayadian, 2015). Moreover, along with the requirements of introducing new teaching and learning methods, theories, instruments, sources, and tools, it has become inevitable that technology-supported classrooms which are tailored to the needs and interests of students of this era take the place of conventional classrooms (Casillas Martín et al., 2019; Prestridge & Tondeur, 2015).

Since the formation and transfer of knowledge, news, and messages in this modern world is a must and has an influence on all fields of people's lives, improving the necessary abilities has also become imperative for pre-service teachers (Fraillon et al. 2014). Hence, teacher education programs have provided the required training for future teachers. Moreover, it has become significant to introduce practical strategies for ICT integration to pre-service teachers with the aim of training teachers who can use technology effectively in the classrooms (Aşık et al., 2019; Drummond & Sweeney, 2017; Kosnik et al., 2016; Yadav, 2016). Additionally, ICT led to questioning the effectiveness of traditional teaching methods, alteration of the teaching methods, and supporting the improvement of variety of teaching methods; and it has

become a crucial constituent of innovations in education (Buabeng-Andoh, 2019; Tezci, 2011).

Many studies reveal that there are many various reasons that make ICT integration essential for teacher education programs (Albayrak & Yildirim, 2015; Hoyles, 2018; McLeod & Carabott, 2019; Rana et al., 2019). First, pre-service teachers are given education related to technology with the intent of improving the fundamental level skills to utilize ICT integration since it gives them opportunities to acquire primary knowledge about how the computer system works, improve skills of communication, and experience various beneficial e-learning atmospheres. In this way, technology integration into the classroom can affect the success of the students in a positive way, and it can promote the improvement of the critical thinking and high order thinking abilities of the students (Farisi, 2016; Lee & Choi, 2017; Røkenes & Krumsvik, 2016; Tondeur et al., 2016). Additionally, preservice teachers have a chance to have an influence over their own learning process with both their truths and errors, and they can decide for themselves about what to study and at what speed they can study depending on their own understandings (Gudmundsdottir & Hatlevik, 2017; McGarr & Johnston, 2019; Yadav, 2016). This autonomy of ICT integration helps pre-service teachers gain self-confidence about their digital competence and make them aware of various digital tools (Chien et al., 2012; Kaufman, 2014). ICT also gives a chance to develop an atmosphere without being dependent on any context so that pre-service teachers can experience constructive learning and the creation of information. Hence, ICT integration can be a valuable part of the learning process (Albayrak & Yildirim, 2015; Kirkwood, 2014). Another important feature of ICT integration is that it allows an opportunity for preservice teachers to understand the relationship between the knowledge that they acquire during the lectures hypothetically and the experience they have during the application process (Hatch et al. 2016). Furthermore, with a sufficient level of training and experience, preservice teachers can be competent in technology integration to have enough self-confidence while benefiting from it (Cózar et al., 2015). Besides, some studies display that preservice teachers' experiences and competencies about ICT integration during the training have a direct effect on their technology use in the future as a part of instructional practices (Aydin, 2013; Buabeng-Andoh, 2019; Japhet & Usman, 2018). Thus, along with the opportunities such as

being more effective and interactive with ICT use in the classroom, pre-service teachers have a chance to take advantage of various options by being aware of abundant resources to reinforce learning in the future (Azmi, 2017; Carabott & McLeod, 2020; Goh & Sigala, 2020; Instefjord & Munthe, 2015; Mirzajani et al., 2016; Rehmat & Bailey, 2014).

There are many different approaches used to promote ICT in teacher education such as online learning, blended learning, open and distance learning, and learner-centered environments (Yadav, 2016). Furthermore, in order to involve ICT in teacher education, giving technical assistance and sufficient foundation, implementing ICT in all contents, taking advantage of multimedia, various software, the internet, and so on are the other actions that are applied to promote ICT integration (Bhattacharjee & Deb, 2016). In a nutshell, ICT integration in educational contexts has started to be implemented, and it also requires to be improved, supported, and generalized to help preservice teachers to develop positive attitudes and perspectives towards the ICT.

## 2.2. Strategies to Prepare Preservice Teachers for Effective Technology Integration / Synthesis of Qualitative Evidence (SQD) Model

Even if various methods such as technology and material development lessons and online guidance organizations are started to be used to improve preservice teachers' perceptions, abilities, and proficiency for influential use of technology in the classroom (Ottenbreit-Leftwich et al., 2010), there is a need for a unified and comprehensive approach to carry out technology improvement strategies in teacher training (Polly et al., 2010). From this point of view, an encompassing synthesis of qualitative evidence (SQD) model was developed by Tondeur et al. (2012) after a comprehensive analysis of 19 studies about the technology development strategies used in teacher education programs.

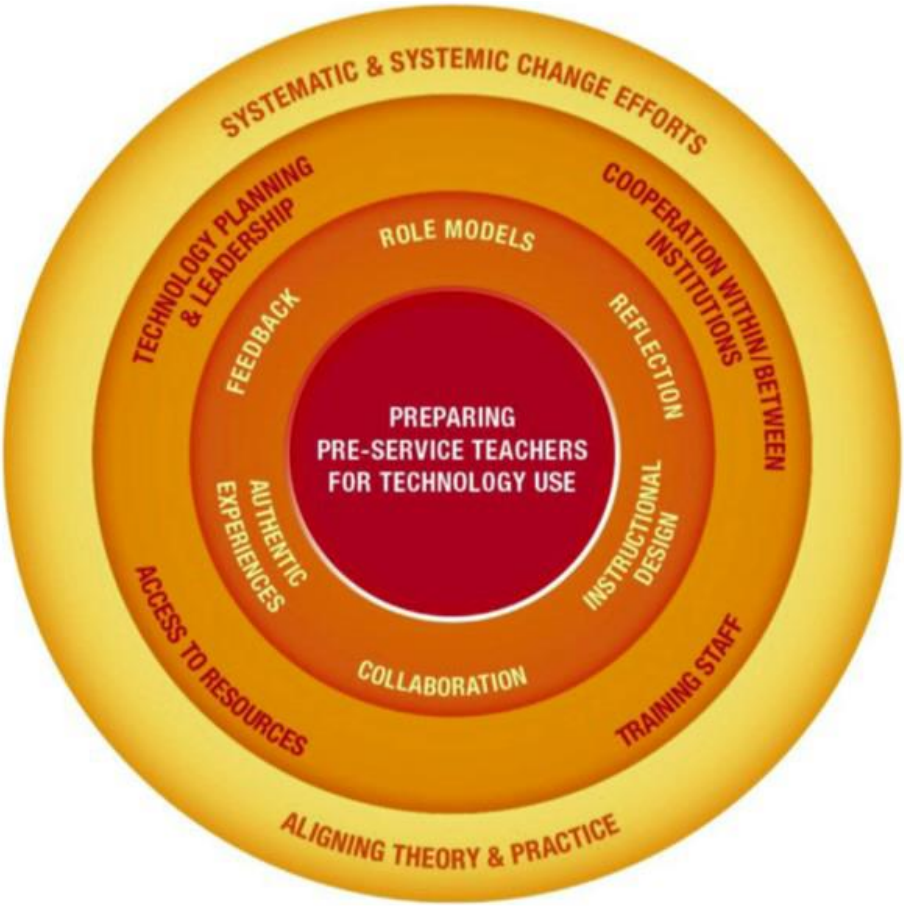



**Figure 2.1:** *The SQD model to prepare pre-service teachers for ICT use. Adapted from "Preparing pre-service teachers to integrate technology in education: a synthesis of qualitative evidence", by J., Tondeur, J., van Braak, G., Sang, J., Voogt, P., Fisser, & A., Ottenbreit-Leftwich, 2012, Computers & Education, 59(1), p.141*.

The SQD model helps teachers to look over and renovate the existing technology integration methods in teacher education by integrating the strategies in it (Baran et al., 2017). While the last two layers towards the outside of the circle demonstrate the circumstances at the institutional stages, two layers inside the circle are comprised of micro-level strategies. Moreover, there are strategies such as cooperation within and between the institutions, technology planning and leadership, access to resources, and training staff at the outward circle, the inner circle is composed of six strategies: feedback, role models, reflection, instructional design, authentic experiences, and collaboration (Tondeur et al., 2012).

While role model strategy is about the requirement of teacher educators behaving like role models in terms of effective ICT use in the classroom for pre-service teachers, it may not always be enough to only observe the educators without experiencing technology integration (Baran et al., 2017). Reflection strategy includes considering and reflecting on using ICT in the classroom with both good and bad sides of it (Ching et al., 2016). For the instructional design, it may be a chance for pre-service teachers to design materials that promote the use of ICT in the classroom (Tondeur et al., 2016), and materials required the use of ICT also helps the improvement of technological pedagogical content knowledge (TPACK) of pre-service teachers (Voogt et al., 2013). Collaboration which is another strategy at the inner circle is about reducing the anxiety level of pre-service teachers when they prepare ICT-enhanced materials for their lesson by sharing their ideas with other people via both online and face-to-face ways of interaction (Tondeur, 2018). As the next strategy, in order to understand the importance of ICT use in the classroom, pre-service teachers should be given the chance to experience it in real contexts before they start to use it in the future, because as Tearle and Golder (2008) stated watching it cannot compensate for doing it. As the last strategy of the inner circle, feedback is one of the most significant things in education to make pre-service teachers see their present abilities to include ICT in their classrooms, and it also facilitates understanding the weak points of their technology integration for educational purposes (Tondeur et al., 2017). As it can be understood from Figure 2.1, the strategies to improve ICT use of pre-service teachers in the classroom should be taken into consideration as interdependent parts of a whole rather than thinking of them as independent of each other (Tondeur, 2018). Since technology use in education is a productive and constant procedure, the capabilities necessary for technology inclusion are not only limited to technology, besides it demands instructional attitudes and content planning. Consequently, integration of technology into the classroom should be an integral and organized process (Sang et al., 2010).

## 2.3. Digital Game-Based Learning

With the universal improvements in technology, children started to live their lives with full-time technology connections, and these children who grow up learning the language of digital games, the internet, and computers are called digital natives. The

way how children think, understand, and interpret information became so different from their ancestors. Hence, digital immigrants, who were not born into technology but who benefited from it even though they could not get rid of the influence of past habits, had to adjust to the different learning and thinking styles of the digital natives. Consequently, to fulfill the learning needs of the new generation, DGBL began to be used as a method of instruction for integrating digital games into the instructional processes as a part of the curriculum with the aim of promoting the learning process in many ways (Prensky, 2001).

DGBL is composed of various exercises that require accomplishing both easy and difficult missions to improve critical thinking and difficult problem-solving skills (Martinez et al., 2022). Hence it has been started to be used in every field of education such as mathematics education (Deng et al., 2020; Hussain et al., 2017), music education (Raziunaite et al., 2018), foreign language education (Blume, 2019, Wang & Cai, 2021), early childhood education (Nikiforidou, 2018, Whitton & Rooney, 2016) and so on. Moreover, digital games used in the educational contexts can be selected from various game categories either as a part of serious games or entertainment games (Deubel, 2006) but there are important points that need to be taken into consideration when including the games in the classroom (Becker, 2018). Age of the students (Behnamnia et al., 2020; Perini et al., 2018; Tisza et al., 2021), characteristics of the students (Guo et al., 2017; Roodt & Saunders, 2017), competitiveness level of the games (Chen et al., 2020; Chen & Chang, 2020), gaming experience (Höyng, 2022), students' special needs (Behnamnia et al., 2020), number of players (Ciussi, 2018), the role of the teacher (Bell & Gresalfi, 2017; Spiteri & Chang-Rundgren, 2020), level of difficulty (Huizenga et al., 2017) and appropriateness to the whole students without any discrimination in any respect (Huang, 2021) are some of the key factors that need to be taken into account to prevent any kinds of problems related to the integration of DGBL. Rules in the classroom and the aim of the lessons are also the other essential parts of the DGBL (Avidov-Ungar & Hayak, 2021). Additionally, for successful DGBL integration students' level of participation and interest should be high, and digital games should continue to promote learning (Coleman & Money, 2019; Kumar et al., 2021; Tisza et al., 2021). To have positive results at the end of the lesson integrated with DGBL, teachers should also be

sure that the results of the games should be understandable for all students, and students should be given feedback continuously throughout the entire process of their development (Erhel & Jamet, 2013).

Prensky (2001) also detailed the combination of interactive amusement and learning by means of digital games as the main distinctive feature of DGBL. Perrotta et al. (2013) also specified learning with fun, genuineness, intrinsic motivation, self-sufficiency, and learning by doing as the other basic characteristics of DGBL. Furthermore, with a rational question of which characteristics of games cause them to become instructional tools, it can be seen from the study of Huizenga et al. (2017) that the feeling of happiness, involvement of students, motivation, and enthusiasm are the most beneficial parts of games. In addition, there are many advantages proposed by the use of DGBL to promote learning (Anastasiadis et al., 2018). First, by its very nature, digital game designs provide players with a chance to build their own worlds, run the hazard, decide the course of events, manage complicated knowledge flows, and resolve problems (Spires, 2015). DGBL is also considered as an encouraging way for learners since it promotes active participation compared to the conventional teaching methods in which students are just passive receivers of information (Bentley, 2006). Students can acquire the chance of being responsible for their learning since they have control of the learning procedure through the games (Prensky, 2001). In addition, players also have a chance to find out five different aspects of freedom, including the freedom to be unsuccessful, liberty to investigate, liberty to the individuality of trend, freedom of endeavor, and freedom of explanation via digital games (Klopfer et al., 2009). Hence, it is a student-centered learning approach that supports the creation of a stress-free environment (Gee, 2005), learning with enjoyment through digital games is more beneficial for students (Mitchell & Savill-Smith, 2004). Moreover, students' being active in a stressless environment during the learning process help them to improve their self-efficacy and self-esteem, and it is one of the other positive sides of digital games (Sitzmann, 2011). Furthermore, if learning takes place in a purposeful and appropriate framework that is closely related to the atmosphere of the game, using games in education is much more helpful than traditional teaching techniques (Van Eck, 2006). DGBL also provides opportunities to improve creative instructional activities in the classroom as well as includes

requirements of master skills such as critical thinking and being open to alteration and decision making (Granic et al., 2014). Moreover, including digital gaming in educational contexts promotes the improvement of problem-solving and visual-spatial skills (Schmidt & Vandewater, 2008). That is why, increment in the school success of the students and advancing their cognitive skills via digital games is another positive effect of DGBL (Barab et al., 2005; Hitchcock, 2000; Rosas et al., 2003). Additionally, digital games support the improvement of psychomotor skills and give players a chance to develop positive spatial orientation competencies that they use in their lives in the future, especially for their professions. Augmented coordination of psychomotor skills, being relaxed by diminishing the stressful environment, and encouraging players to think and discuss in a meaningful way are among the other positive effects of using digital games in educational contexts (Clark & Ernst, 2009). Even if not by itself, technology use in education is one of the things that increase students' motivation. Since most of the students are familiar with the latest technology trends, and they take advantage of using technology in every field of their lives, digital games can be used to attract students' attention and make them involved in the lesson. One of the most outstanding features of digital games is their being entertaining for people of all ages so that amusement is used as one of the positive characteristics of DGBL that can strengthen the motivation of students (Avidov-Ungar & Hayak, 2021). Moreover, giving players constant feedback, ensuring them having a fascinating experience in games' worlds, and the exciting nature of the games increase the learners' motivation. Some other research also confirmed that digital game use in the classroom promoted students' concentration, the persistence of knowledge, and motivation (Breien & Wasson, 2020; Chen et al., 2020; Tisza et al., 2021; Woo, 2014). The upshot of all this is that digital games can arouse enjoyment, motivation, and involvement by promoting the improvement of both cognitive and social abilities of the students (Erhel & Jamet, 2013; Liao et al., 2019; Mitchell & Savill-Smith, 2004).

Even though the result of some research shows that DGBL has the potential to promote learning in the classrooms (Girard et al., 2013; Hamari et al., 2016; Hersh & Leporini, 2018; Kaimara et al., 2020), there are also some barriers prevent the use of DGBL (Fokides & Kostas, 2020; Kaimara et al., 2021; Spiteri, & Chang-Rundgren, 2020). Attitude toward DGBL is one of the main obstacles to integrating it into the subject

matter because some people believe that digital games are useless and inappropriate for use in educational contexts (Charsky & Ressler 2011; Dickey, 2015; Kaimara et al., 2021; Uluay & Dogan, 2016; Wu et al., 2014). Therefore, DGBL does not have enough space in some classrooms in comparison with conventional instruction techniques (Clark, 2007; Watson et al., 2013). Additionally, since using digital games can be aggravating and difficult as a way to teach, some teachers may ignore the capability of the games to encourage students to participate in the lessons as well as overlook the cognitive procedure of purposeful learning (Clark et al., 2010; Papadakis, 2018).

Moreover, integrating exercises with DGBL into the subject matter or teaching process and assessing the learning results as well as classroom management problems may lead to some anxiety and distrust for teachers (Hayak & Avidov-Ungar, 2020). Teachers generally do not have enough information or competencies associated with DGBL because of inadequate professional development courses or training during their teacher education (An & Cao, 2017; Ashrafzadeh & Sayadian, 2015; Bell & Gresalfi, 2017; Kaimara et al., 2021; Uluay & Doğan, 2016) but even if they have enough training or occupational experiences, some teachers do not have a chance to use digital technologies due to the lack of necessary and user-friendly equipment is one of the other main problems for DGBL (Martín-del-Pozo et al., 2017; Van Eck et al., 2015).

## 2.4. DGBL in Teacher Education

One of the things that should be promoted in school atmospheres is to understand the importance of everyday technologies and the adoption of them that are also common beyond school boundaries (Hébert et al., 2021). Hence, the integration of DGBL into instructional practices is increasing day by day since it is seen as a promising tool to assist the improvement of 21st-century skills such as cooperation, originality, communication and critical thinking (Charlier & De Fraine, 2012; Garneli et al., 2016; Frydenberg & Andone, 2011). DGSSL also supports the information acquisition process, increases the level of knowledge and motivation, and improves behavioral and cognitive skills (Backlund & Hendrix, 2013; Denham, 2017; Fokides, 2020;

Kaimara & Deliyannis, 2019; Megagianni & Kakana, 2021). Since it makes use of simulations and computer-generated settings, DGBL has the advantage of paving the way for the improvement of 21st-century competencies (An & Cao, 2017).

Moreover, additional techniques of ICT integration can be put into use via the capability of DGBL along with its power to make people obtain abilities that they can use in the future as a part of their occupation (Charlier & De Fraine, 2012). That is why it is inevitable for teacher education programs to include DGBL since teachers are at the decisive parts of the accomplishment of DGBL implementation in terms of making a determination about how, when, and why it should be included in the classroom (Beavis et al., 2014; Hayak & Avidov-Ungar, 2020; Li & Huang, 2016). Although their importance in the DGBL implementation process, only a few studies are associated with teachers' perceptions (Huizenga et al., 2017; Li & Huang, 2016; Mertala, 2019; Proctor & Marks, 2013). However, teachers' opinions about whether they are shareholders as a part of the development is one of the crucial points for effective DGBL integration, and teachers' perceptions of DGBL are directly affected by their experience and familiarity with the concept (Avidov-Ungar, 2018), as well as the significance of teachers' attitudes as substantial determinant in DGBL integration into the teaching processes (Bell & Gresalfi, 2017; Kangas et al., 2016; Sanchez-Mena et al., 2019).

Taking the related literature into account, some studies draw attention to the insufficient number of professional development courses and programs related to DGBL and they emphasized the importance of DGBL instruction for teacher education programs (An et al., 2016; An and Cao 2017; Becker, 2007; Denham et al., 2016; Gaudelli & Taylor, 2011). According to Takeuchi and Vaala (2014), even if teachers take advantage of digital games during their teaching, merely 17% of them have education about the use of DGBL in the classroom via a course of professional development programs. The others have information about digital games thanks to their teachers, supervisors, or their own efforts. Even if learning via other people's help is really precious, it may also have some drawbacks such as getting the wrong instruction or inadequate information about the integration of DGBL. Additionally, informal teaching cannot be as organized and inclusive as the professional

development courses. These courses or programs also provide many various instructional techniques, sources, and kinds of games so that teachers can have more experience than the informal ways of learning.

According to Tsekleves et al. (2016), there are both educational, technical, and financial obstructions that inhibit teachers' DGBL integration into their instructional practices. According to them while finding the convenient games associated with the subject matter, ensuring that games are capable enough to match with the learning needs of the students, and games' being adaptable to real-life situations are some of the educational barriers; game designs, platforms that games are played, marketing, and expense to buy and produce games are some of the technical and financial barriers. Moreover, teachers' disbelief in the power of DGBL as an educational tool (Dickey, 2015; Fokides & Kaimara, 2020; Mertala, 2019), perception and attitude towards DGBL (Allsop et al., 2013; An & Cao, 2016; Sanchez-Mena et al., 2017; Sardone, 2018), pedagogical challenges (Beavis et al., 2017; Fokides & Kostas, 2020; Foster & Shah, 2020), having not enough experience or training and thus do not having self-confidence about DGBL implementation (Allsop & Jessel, 2015; An, 2018; Li & Huang, 2016; Uluay & Dogan, 2020), lack of accessing to the necessary resources such as lack of time management, classroom environment, and financial infrastructure (Papadakis, 2018; Sanchez-Mena & Marti-Parreno, 2017), and classroom management (Acquah & Katz, 2020; Hébert et al., 2021; Nolan & McBride, 2013) problems are some of the other challenges that prevent the use of DGBL by the teachers for instructional purposes. That is to say, all of these potential barriers influence either directly or indirectly whether teachers prefer to apply DGBL in the classroom so overcoming possible barriers may contribute to integrate DGBL into teacher education programs (Allsop & Jessel, 2015; Papadakis, 2018).

## 2.5. Teachers' Attitudes toward Gaming in Education

There are many different components that affect the purposeful use of computer technology in education. Since teachers are the people who decide the amount of technology implementation in the classrooms, it is significant to find out their attitudes and perceptions towards technology and digital gaming in education to promote

students' learning processes and take advantage of the technology integration for instructional purposes (An & Cao, 2016; Baturay et al., 2017; Blackwell et al., 2016; Martí-Parreño et al., 2016; Voulgari et al., 2020).

Accordingly, when the literature is examined, it was concluded that many studies were performed to figure out teachers' attitudes towards digital game-based learning (Blume, 2019; Can & Cagiltay, 2006; Chik, 2011; Mozelius et al., 2017; Sardone, 2018 Wu, 2015). Tomczyk et al. (2020) classified the attitudes of teachers towards using technology into four different groups as techno-ignorant, techno-pessimist, techno-realist, and techno-optimist. While techno-ignorant teachers do not use technology in their teaching, techno-pessimists do not think that integrating the latest technology into the classroom cannot be beneficial and supportive for the learning process of the students. Moreover, techno-realists approach with caution to the recent technological opportunities by thinking both critically and deliberately, but while doing this, they do not have any disinclination to the use of new technologies. As the last group techno-optimists are really interested in technology and excited to use it in the classroom with the belief of incorporation of technology is very important for successful teaching and learning (Tomczyk et al., 2020).

Having some experience with digital games whether by playing, designing, or investigating them positively influence teachers' attitudes towards the utilization of digital games in education (An & Cao, 2016). Some studies conducted by Ray and Coulter (2010) and Kenny and McDaniel (2011) also revealed that pre-service teachers' attitudes towards digital gaming in education were affected in a good way after playing and investigating digital games. In line with these studies, it was concluded from the study of Sardone and Devlin-Scherer (2010) that digital gaming experience affected pre-service teachers' attitudes toward game-based learning positively, and they indicated that digital games create favorable and motivating circumstances for students. Moreover, Kennedy-Clark et al. (2013) carried out a case study that was interested in improving the skills of preservice teachers to promote inquiry-based learning with gaming. For this purpose, researchers took advantage of an online game called death in Rome in a pre-service science teacher training course and aimed to improve prospective teachers' computer-supported inquiry learning. The

results of the study revealed that teachers' attitudes evolved in a positive way after having some experiences with digital games.

Another research was conducted with 116 Computer Education and Instructional Technology preservice teachers from four different universities in Turkey to find out their attitudes towards digital gaming for educational purposes. The results of the study showed that preservice teachers have positive attitudes towards digital gaming in education, and they want to prepare lesson plans with educational games to promote students' learning in the future (Can & Cagiltay, 2006). Another significant research study conducted by Ruggiero (2013) in the concern of taking advantage of using DGBL in the classroom is conducted with1704 participants including both in-service and pre-service teachers. The results of the study displayed that while in-service teachers are less eager to use DGBL in their classrooms, preservice teachers stated that they want to use digital gaming in the future. However, both groups approved the importance of gaming in education and agreed with the idea that digital games should be more incorporated into the lesson plans since they have the common idea that games are more than being simply for fun, especially for this generation (Ruggiero, 2013).

In addition, according to a study conducted by Gibson et al. (2007), it was pointed out that about sixty-five percent of the 228 pre-service teachers believed that digital games can be used as beneficial learning instruments in educational settings, but seven percent of the participants thought that games are useless and have no significant positive effects for education. Furthermore, the study also showed that in terms of attitudes towards digital gaming in education, there were some dissimilarities between gamer and non-gamer teachers. Additionally, depending on the results of the studies mentioned above, it can be concluded that there are also some differences between pre-service and in-service teachers in terms of their attitudes towards playing digital games for educational purposes because of the age differences. While pre-service teachers are more enthusiastic about technology use like other new teaching methods, mostly in-service teachers are not very interested in technology integration with different concerns (Alyaz & Genç, 2016). Although they indicated that they have good attitudes toward digital games and want to use the games in their classes, their low level of pedagogical knowledge about digital games and lack of technical

infrastructure are really important challenges (Chandler, 2013; Karadag, 2015), along with time and classroom management issues and assessment problems (Kopcha, 2012; Yilmaz-Ince & Demirbilek, 2013). Hence, including DGBL in the curriculums of teacher education programs to improve preservice teachers' knowledge, and give them a chance to experience these kinds of games integration into education is a must before the anticipation of more digital game use for instructional purposes (Al-Zaidiyeen et al., 2010; Cetin, 2016).

## 2.6. Digital Gaming Experience

With the development of technology and the digital gaming industry, the number of gamers is increasing day by day, so teachers also have started to use digital games more than they did in the past. However, even today many teachers are not aware of the power of digital games for educational contexts (Fokides & Kostas, 2020; Kaimara et al., 2021). There are many possible explanations for not taking advantage of digital games in education. For instance, teachers are mostly inexperienced and negligent towards the power of games that can promote students' skills (An & Cao, 2016). Furthermore, findings of some studies revealed that teachers were not eager to use DGBL since they did not believe that games could be beneficial for educational purposes, and their gaming experience, digital self-efficacy, perceptions of stakeholders in education were some of the key factors that trigger the negative attitude towards DGBL (Fokides & Kaimara, 2020; Hamari & Nousiainen, 2015; Mertala, 2019).

Additionally, there is still an important discrepancy between the use of technology in schools and out of school. Even if most of the students spend their leisure time playing games, hanging out on social media, and trying to do their homework via computers, technology use is more limited at schools (Ibieta et al., 2017; Iivari et al., 2020; Marshall et al., 2020; Rezaei & Meshkatian, 2017; Vargo et al., 2020; Wang et al., 2014).

On the other hand, digital natives who are the teachers of the future believe that DGBL may foster the teaching process (An, 2018; Ijabah, 2018). Investigating the DGBL experiences of teachers and having an idea about their perceptions about these

experiences may enlighten the willingness of using DGBL in classes (Huizenga et al., 2017). Hence, teachers' experiences and perceptions about incorporating DGBL into education have a critical value to foster learning (Belda-Medina & Calvo-Ferrer, 2022; Hayak & Avidov-Ungar, 2020; Kaimara et al., 2021).

According to a study conducted by Schrader et al. (2006), pre-service teachers are not knowledgeable enough about the instructional benefit of digital games, and they had little experience or did not have any experience at all about playing digital games or using them for educational purposes. In the same way, another study about the importance of digital games in terms of educational concerns conducted by Blume (2019) revealed that pre-service teachers are not accustomed to digital games, and they have worries about the advantages of including games in education, despite the experience of playing different digital games during the study.

Some studies took the relationship between gaming experience and preservice teachers' attitudes toward game-based learning into consideration. While Ray and Coulter (2010) investigated the effect of playing digital games on teachers' attitudes towards the importance of digital games; Kenny and McDaniel (2011) made research about pre-service teachers' experiences of digital gaming. Similarly, both studies revealed that attitudes of most of the pre-service teachers evolved in a positive direction after experiencing some digital mini games. They explained that they could not be aware of the support of digital games if they did not experience them by themselves, and they thought that these games can also help to promote purposeful learning.

Another interesting study administered by Sardone and Devlin-Scherer (2010) is done with pre-service teachers to discover their skills about digital games and capability to identify the motivational elements. Pre-service teachers first learned how to play a specific digital game, then they played it. Later, they made a lesson plan including the game they played and tried to teach with the game. After their teaching experiences, participants stated that they had good feelings towards DGBL, and they were more self-assured than the inexperienced times about games. According to another study conducted by Li et al. (2013) at a Canadian university with pre-service teachers, the

DGBL experience of the participants was investigated. While different kinds of digital games were presented to the pre-service teachers first, later they were included in the lesson plan preparation process. Even if it was not easy to make a difference in their attitudes towards the digital games at first, pre-service teachers agreed that it was a great opportunity to improve their problem-solving skills. All in all, they stated that the game design study made a real contribution to understanding the value of digital gaming in educational contexts.

Moreover, a study conducted by Sancar et al. (2013) wanted pre-service teachers to remake the digital games that already exist rather than ask them to design a new one. In the study, there were two different circumstances. In the beginning, pre-service teachers were required to choose a game and then plan a lesson associated with the game that was selected. Later, pre-service teachers tried to redesign the games that they had chosen before and prepared a new lesson plan. When the two conditions were considered, it was clarified that most of the participants adjusted the digital games and their lesson plans. Surprisingly, while the participants thought to use behaviorist philosophy while they were choosing the games at the first phase, during the redesign process, pre-service teachers took use of constructivist learning theory.

Another study Li (2012) conducted with pre-service teachers investigated the opportunities and restrictions of the participants' experiences about designing digital games with the aim of pedagogical concerns. This study was administered at the Canadian university, and pre-service teachers were introduced to digital game-based learning literature along with the digital games for a specific period of time. After the training part, pre-service teachers were asked to prepare their lesson plans with educational games. The findings revealed that being included in the process of preparing game-based lesson plans and having more knowledge about the DGBL literature helped the participants to develop their awareness about digital games and their usage in education. Moreover, the participants acquired a comprehensive point of view since they endeavored to merge various themes, information, and abilities via digital games.

## 2.7. Digital Gaming Self-efficacy

Self-efficacy is defined as “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” by Bandura (1997). According to Bandura's social cognitive theory, self-efficacy is about people’s reliance on what they can achieve by taking advantage of their own abilities under specific conditions, and it affects how people learn, how they perform, and be motivated while they try to do something (Bandura, 1986). That is to say, if a person believes in herself/himself that she/he can do it, the probability of being involved in the work is higher (Klimmt & Hatmann, 2006).

In the DGBL world, digital gaming self-efficacy refers to the belief of a person in himself/herself about the skills that are required to play the digital games in a successful way (Hsu & Chiou, 2019). According to a study of An (2018) conducted with 21 teachers about the impacts of a professional development course on digital gaming- self-efficacy, it was revealed that self-efficacy levels of the participants significantly increased after taking a professional development course (An, 2018). Another study conducted by Wang et al. (2004) with pre-service teachers also revealed parallel results. Pre-service teachers’ self-efficacy beliefs were measured via pre- and post-surveys after an experimental design. Findings of the study displayed that vicarious experiences and goal setting had a significant effect on participants’ technology integration self-efficacies, and it showed that students can take advantage of these variables to improve their belief in themselves to integrate technology use into the classroom.

Research has also shown that gameplay and game design experiences have an influence on pre-service teachers’ self-efficacies. In their study An and Cao (2016) required participants to read, design, and review their friends’ game designs. When the pre- and post-surveys about the self-efficacy and attitudes toward digital games in the classroom were compared, it was concluded that the experience of game design affected the participants’ self-efficacies in a positive way. After completing their own games, pre-services teachers gained confidence and enthusiasm to use digital games in educational contexts.

Similarly, Orvis et al. (2006) conducted a study with 364 university students to investigate digital gaming self-efficacy, digital gaming experience, and goal orientation in terms of escalating participants' motivation in digital game-based learning. The participants were asked to play a game, complete some tasks, and finally fill in the questionnaire. The findings of the study revealed that the more time they spent playing the game, the more participants' motivation increased, and it helped to improve their digital gaming self-efficacy in education. In another important study conducted with 120 undergraduate students by Pavlas et al. (2010) the focus was on the components of serious games and their connection with the learning process. During the study, first participants were given a general knowledge about the game that they would play and then they experienced the game play. The results displayed that video game self-efficacy and flow state are significant learning predictors so that the study concluded that students' self-efficacy about video games can promote their learning.

## 2.8. Potential Barriers to Digital Gaming in the Classroom

Digital game-based learning drew great interest in recent years with the advent of various technologies in our lives, but the instructional use of digital games is not at the required standards because of some barriers (Alyaz & Genç, 2016). Some studies agreed that teachers and parents do not have positive attitudes towards digital games with the fear that digital gaming can be addictive, time-consuming, and can create incitement to violence (Demirtas, Zorbaz et al., 2014; Allsop et al., 2013; Bauer & Kenton, 2005). Also lack of necessary technology skills among teachers (Waight & Abd-El-Khalick, 2007) and culture, and resources of schools are other possible obstacles to making use of technology and digital game-based learning in the classroom (Zhao et al., 2002). However, day by day game industry progress rapidly and the number of adults gamers is increasing (Bil et al., 2021) so that colleges has started to offer courses including DGBL that can be helpful to overcome the obstacle about using digital games in educational contexts (Papadakis, 2018).

Kaimara et al. (2021) conducted a study with pre-service teachers to investigate their opinions about the use of DGBL in the classroom via an online survey. Findings of the

study revealed that while money affairs are the main concern, conventional instructional techniques, and attitudes towards the importance of digital games, and insufficient practice of ICT are among the other barriers. These obstructions split into two groups as the external and internal barriers of the fulfillment of DGBL. Similarly, the studies of Ertmer (1999) and Koh et al. (2012) indicated a classification of internal and external barriers to the implementation of technology in educational contexts. While internal barriers are composed of perceptions of teachers about their roles, attitudes towards technology, and evaluation methods; external barriers consist of having necessary technological devices, teacher education and assistance, and policies.

Even if teachers take advantage of technology to prepare lesson designs or to have contact with the parents, they are far from the idea that digital games can improve students' way of thinking, and these games make the lessons more student-centered (Rehmat & Bailey, 2014). It means that technology is still exploited to continue organizational works at school but not for instructional concerns. Moreover, teachers generally do not have enough qualifications, information, and experience to successfully integrate technology and digital games into their classes Nonetheless, it is essential to improve pre-service teachers' technology self-efficacy to keep up with the demands of the time and gamer generation (Becker, 2007).

Attitudes of teachers towards technology are quite substantial for their preference to use digital games in their classes so that when their experiences of using DGBL are taken into account, it may be seen how eager they are to incorporate digital games into their lessons (Huizenga et al., 2017). On the other hand, there is a discrepancy between teachers' attitudes towards DGBL and their implementation of it in the classroom. According to a study conducted by NFER (2009) revealed that 85% of the participants have good feelings about DGBL use in the classroom but only about a third of those who have positive ideas about using DGBL in the classroom take advantage of digital games in their classrooms in real. Another study showed that teachers have various reasons that limit the use of DGBL in their classrooms. These reasons are comprised of technical issues, instructional concerns, and fundamental problems but the most outstanding barriers were about the defectiveness of necessary equipment, inadequate knowledge, and experience about DGBL of teachers, and concerns about classroom

management (Klopfer et al., 2009). The study of Allsop and Jessel (2015) also supported the idea that teachers do not have enough digital gaming self-efficacy and knowledge to use it in their classrooms. Furthermore, teachers explained that they did not have any opportunity to learn how they can take advantage of DGBL via professional development courses or any other training. Additionally, another study (Baek, 2008) displayed that depending on their working experiences teachers have different perceptions of the implementation of DGBL in educational contexts. While teachers who are teachers for a minimum of 11 years indicated that their limitation of using DGBL is about the strictness of curriculum and instructional conditions, novice teachers declared that they do not have enough materials to use DGBL in the classrooms and they do not have enough time to include digital games into their lesson plans (Baek, 2008).

A study conducted by FutureLab (2009) gave teachers a chance to play computer games and experience DGBL themselves. After the experience, most of the teachers agreed that digital games can be helpful to improve critical thinking and ICT skills, while 44% of the participants believed that these games can be addictive and make students introverted individuals. Depending on the survey conducted with teachers, games' costs, concerns about permission, lack of technology usage knowledge of teachers, improper style of the games, and instructional concerns were the most popular barriers that prevented DGBL use in the classroom. In line with FutureLab's (2009) research, Millstone (2012) had parallel results from a survey done with the 505 teachers about their attitudes about digital games in the classroom. Half of the participants thought that expenditure is the main problem to integrating DGBL in the classroom pursued by having an opportunity to benefit from the technological resources. In addition, anxiety about students' being successful in the standardized tests is one of the other essential obstacles in company with some parents' and school managements' not being supportive to use of DSBL in the classes.

## 2.9. Summary of Literature Review

While ICT stands for all communication technologies to acquire, gather, transform, share, and reveal information, DGBL refers to an instructional method that involves

the integration of digital games as a pedagogical tool. There are some factors that affect ICT use and DGBL integration in educational contexts. However, since teachers are the key factors and the heart of the teaching process, among the other variables, they have a special standing. That is why it is essential to understand their perspectives toward both ICT and DGBL with the growing interest in teacher characteristics in educational research.

The literature review in the present study revealed that authentic experience, collaboration, instructional design, reflection, role models, and feedback are the salient variables that investigate the use of ICT strategies in teacher training programs depending on the inner circle of the SQD model. Moreover, attitude toward DGBL, gaming experience, digital gaming self-efficacy, and potential barriers to the implementation of DGBL are also the most commonly used variables in the literature to investigate the perception of pre-service teachers toward DGBL.

When the literature is taken into account, studies about ICT display that technology integration into the educational contexts is increasing day by day, and teachers' points of view are changing positively to meet the needs of the students of the new generation. Furthermore, the studies related to DGBL also show that even if DGBL still does not have enough space in the classrooms, its integration also increasing compared to the past. However, DGBL is mostly seen as a learning aid that promotes students' involvement, motivation, and interest rather than improving cognitive skills or high order thinking skills.

The relevant literature about the variables mentioned above generally indicates multidirectional relations. Particularly, the relationship between preservice teachers' perception of ICT and DGBL induced to change with regard to especially gaming experience and attitudes of pre-service teachers. That is to say, while positive experiences and attitudes are positively related to the construct, negative ones are negatively related to it. Taken all of the variables together, this study aims to investigate the relationship between pre-service teachers' perceptions of the strategies used in teacher education to facilitate ICT integration and DGBL in a Turkish educational context.

# CHAPTER 3

# METHOD

This chapter intends to present the research methodology of the study in detail. First, an overall research design is introduced. Next, research questions for the purpose of this study are included. After that, descriptions of the variables in the study are stated separately. Then, information about participants of the study, data collection instruments, data collection procedures, and data analysis are provided in this chapter in different sections. In the very last section of the method chapter, the limitations and assumptions of the study are discussed.

## 3.1. Research Design

The research design of the study was correlational research, and it aimed to investigate the relationships between two or more quantifiable variables without manipulating them (Fraenkel et al., 2015). Accordingly, the main purpose of the present study was to find out any relationship between pre-service teachers' perceptions about the strategies used in teacher education to facilitate ICT integration and their perceptions about digital game-based learning. Data were collected from the third and fourth-year education faculty students at universities located in Ankara. Data collection instruments included the DGSL Scale (Hsu & Chiou, 2019) and the Synthesis of Qualitative Evidence Scale (*SQD*; Tondeur et al., 2016).

## 3.2. Research Questions

This study aimed to answer the following research question:

1. How well can the pre-service teachers' attitudes of digital game-based learning be predicted by their perceptions of the strategies used in teacher education to facilitate technology integration?

2. How well can the pre-service teachers' self-efficacies of digital game-based learning be predicted by their perceptions of the strategies used in teacher education to facilitate technology integration?

3. How well can the pre-service teachers' perceptions of digital game-based learning be predicted by their perceptions of the strategies used in teacher education to facilitate technology integration?

### 3.3. Participants of the Study

The target population of the current study consisted of third and fourth-year university students who studied at education faculties in Ankara. Because of time restrictions, it was difficult to have access to all universities in various districts in Ankara.

Convenience sampling methodology was applied for sample selection. Number of university students from different education departments were identified by getting contact with each department secretaries. Additionally, students who admitted participating in the study created the sample. In this way, data collected from 306 pre-service teachers.

In terms of participants characteristics, their ages ranged from 21 to 40. While female participants made up 68% (*n*=201) of the total group, males comprised 34.3% (*n*=105). Moreover, participants were chosen from 3$^{rd}$ year (*n*=103) and 4$^{th}$ year (*n*=203) students since they were more experienced and had chance to see more about ICT integration strategies used in the teacher education program. Participants were from seven different education departments: foreign language education (*n*=75, 24.5%), early childhood education (*n*=58, 19%), computer education and instructional technology (*n*=35, 11.4%), chemistry education (*n*=17, 5.6%), physics education (*n*=17, 5.6%), mathematics education (*n*=68, 22.2%), and elementary science education (*n*=36, 11.8%).

**Table 3.3**

*Frequency Distributions of Participants by Gender, Age, Department and Grade Level (n = 306)*

| | Frequency *(f)* | Percent *(%)* |
|---|---|---|
| Gender | | |
| Female | 201 | 65.7 |
| Male | 105 | 34.3 |
| Age | | |
| 21-24 | 275 | 89.8 |
| 25-28 | 27 | 8.9 |
| 29-32 | 2 | .7 |
| 33-36 | 1 | .3 |
| 37-40 | 1 | .3 |
| Department | | |
| Foreign Language Education | 75 | 24.5 |
| Early Childhood Education | 58 | 19 |
| Computer Education and Instructional Technology | 35 | 11.4 |
| Chemistry Education | 17 | 5.6 |
| Physics Education | 17 | 5.6 |
| Mathematics Education | 68 | 22.2 |
| Elementary Science Education | 36 | 11.8 |
| Grade Level | | |
| 3rd grade | 103 | 33.7 |
| 4th grade | 203 | 66.3 |

## 3.4. Data Collection Instruments

Two different instruments were used to gather data in the current study. These are the Synthesis of Qualitative Evidence (SQD) Scale and the Digital Game-Based Learning (DGBL) Scale. Additionally, demographic information about participants (gender, year of birth, grade level, and department) was collected.

### 3.4.1. Synthesis of Qualitative Evidence (SQD) Scale

The SQD Scale was developed by Tondeur et al. (2016) depending on the inner circle of the SQD model. This model includes useful strategies to prepare pre-service teachers for effective technology integration in the future as a part of their professions (Tondeur et al., 2012). While the SQD model is composed of both micro and institutional-level strategies, the SQD scale contains six dimensions which are micro-level strategies such as role model, reflection, instructional design, collaboration, authentic experience, and feedback. Moreover, the SQD scale is a self-report instrument and has a six-point Likert type scale. It ranges from totally disagree to totally agree. The scale includes 24 items, and it was adapted to Turkish language by Baran et al. (2019). Sample items are as follows for each emotion dimension: "I saw good examples of ICT practice that inspired me to use ICT applications in the classroom myself" (Role model, item 3); "I was given the chance to reflect on the role of ICT in education" (Reflection, item 5); "We learnt how to thoroughly integrate ICT into lessons" (Instructional design, item 10); "Students helped each other to use ICT in an educational Context" (Collaboration, item 15); "There were enough occasions for me to test different ways of using ICT in the classroom" (Authentic experience, item 17); "I received sufficient feedback on how I can further develop my ICT competences" (Feedback, item 23).

Exploratory factor analysis (EFA) was conducted by Tondeur et al. (2016) to examine the dimensions of the scale. Depending on polychoric correlations in the R package psych, the EFA was assessed. Single factor was determined by eigenvalue criteria and scree plot by explaining 63% of the variance. Moreover, descriptive statistics did not display any outliers for the items, and the corrected item-to-total correlations were above .50 showing evidence of scale homogeneity. Additionally, the Cronbach alpha coefficients for six domains were as follows: $\alpha$ =.91 for role models, $\alpha$ =.89 for reflection, $\alpha$ =.90 for instructional design, $\alpha$ =.87 for collaboration, $\alpha$ =.83 for the authentic experience, and $\alpha$ =.93 for feedback. The scale with 24 items in total showed excellent overall reliability with $\alpha$ =.98.

For the current study, the SQD scale that was adapted to the Turkish language by Baran et al. (2017) was utilized. Confirmatory Factor Analysis (CFA) was conducted to check the construct validity of the new version and affirm the SQD model which was detailed by Tondeur et al. (2016). Cronbach's alpha reliability of the Turkish version of the SQD scale ($r$ = 0.97, $p<0.05$) was checked and correlation coefficients ranged from .58 to .83 with significant values ($p<0.05$). Moreover, the fit indexes (chi-square/SD, RMSEA, NFI, NNFI, CFI, GFI, AGFI) demonstrated a good fit between the data and the model structure. In order to evaluate the reliability of the overall scale and the six dimensions, Cronbach's alpha was controlled. While the overall scale's Cronbach alpha coefficient was α =.97, the Cronbach alpha coefficients for six domains were as follows α =.88 for role model, α =.87 for reflection, α =.89 for instructional design, α =.89 for collaboration, α =.90 for the authentic experience, and α =.93 for feedback with a conclusion that the scale had excellent reliability.

### 3.4.2. Digital Game-Supported Learning (DGSL) Scale

The Digital Game-Supported Learning (DGSL) scale was developed by Hsu and Chiou (2019) to explore the pre-service teachers' perception of DGBL and adapted to Turkish language by the researcher for this study. The scale is a multidimensional self-report instrument consisting of four dimensions and forty-nine questions. The four dimensions included in the scale are respectively; digital gaming experiences, attitudes toward digital gaming, digital gaming self-efficacy, and perception of DGBL. In the first section of the data collection instrument, there are four questions related to demographics of pre-service teachers. In a more detailed way, participants are asked questions about their gender, age, grade and departments. The next section contains 14 questions about the digital gaming experiences of pre-service teachers to figure out their experiences with gaming in the past and present by making them remember about the types of games they play, frequency of gameplay and places where they play games. Later, while third section consists of 5 questions associated with pre-service teachers' attitudes toward digital gaming, fourth sections is about digital gaming self-efficacy and again composed of 5 questions. Items in digital gaming self-efficacy part are actually obtained and improved from the New General Self-Efficacy Scale (Chen et al., 2001). Last section of the scale involves 16 items concerning the pre-service

teachers' perceptions of DGBL. Items in this section cover the advantages of DGBL, the potential obstructions of digital game integration, and acceptance of game-based learning. Except for the first two sections which are about the demographics and experiences of the participants, the scale is composed of a 4-point response format from 1 (strongly disagree) to 4 (strongly agree), in which a higher score displays stronger agreement. Questions about demographics and experiences are either open-ended or multiple-choice questions.

In this study, 44 items of the Turkish version of the Digital Game-Supported Learning (DGSL) Scale was used to investigate the pre-service teachers' perceptions about DGBL. Sample items for four dimensions might be presented successively: "I believe playing digital games can motivate players to engage in the situation." (Attitude, item 15); "Even if facing difficult gaming, I believe I can overcome the challenges to achieve the gaming goals." (Digital gaming self-efficacy, item 24); "I think educational games can enhance students' problem-solving ability." (Perception of DGBL, item 30).

### 3.4.3. Adaptation Process of the Digital Game-Supported Learning (DGSL) Scale

The Digital Game Based Learning (DGBL) scale was developed by Hsu and Chiou (2019), and it is available in the English language originally. For this study, the questionnaire was translated into the Turkish language by the researcher and two other people who are experts in both Turkish and English languages. In the next step, back-translation procedure was applied by two other experts who has expertise in both Turkish and English to compare the equivalence of the translations in both languages. Eventually, the questionnaires in two different languages were reviewed in detail to check out whether there were some differences, but the results of the examination revealed that there were not any words or expressions that the experts did not agree on. The experts stated that only the expressions of stand-alone and online games could be confusing for the participants, however, after taking opinions of some people who had similar features with the target population, it was decided to keep the translations of these words as it was in the beginning since they did not create any confusion.

Moreover, experts' opinions were received on whether there were any problems with the format, directions, or clarity in the questionnaire to demonstrate evidence if the questionnaire appears to measure what it intends to measure as a part of face validity (Brislin et al., 1973).

### 3.4.4. Pilot Study of the Digital Game-Supported Learning (DGSL) Scale

The Digital Game Supported Learning (DGSL) scale was pilot tested to provide validity and reliability evidence, and Exploratory Factor Analysis (EFA) was performed with SPSS 26.0 to find out the structures of the factors in the scale.

For the pilot study, the sample of the study consisted of 286 pre-service teachers who study at different universities in Ankara. Among the participants, while 67.5% of them were female (*n*=193), 32.5% were male (*n*=93). The years of birth of the participants ranged from 1993 to 2004. 39.2% (*n*=112), 44.1% (*n*=126), 11.5% (*n*=33) and 4.2% (*n*=12) of the participants were first year, second year, third year, and fourth-year students respectively (with three missing values). Moreover, as can be seen from Table 1, participants were from 12 different teacher education program departments. Most of the participants were from the foreign language education department (*n*=65), and it was followed by the elementary education (*n*=48) and mathematics education (*n*=45) departments.

**Table 3.4.4**

*Departments of pre-service teachers*

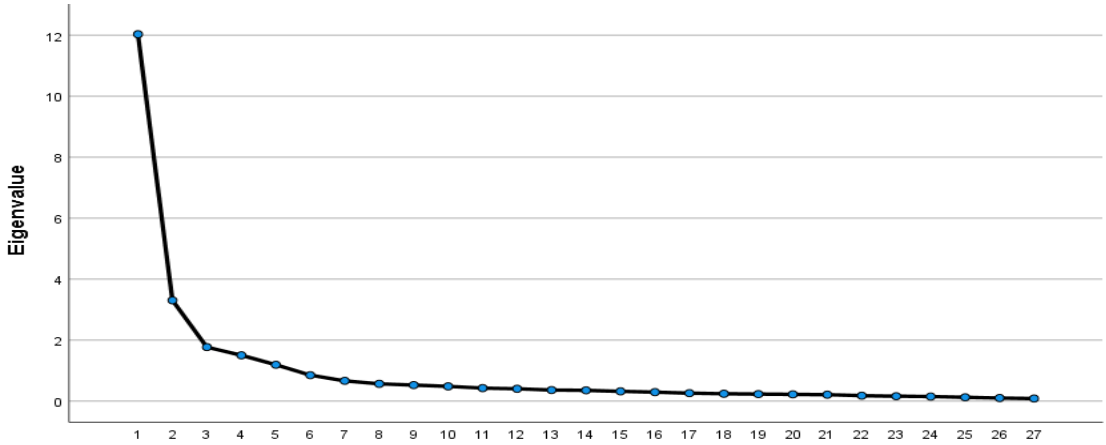
| | N | % |
|---|---|---|
| Mathematics education | 45 | 15.7% |
| Social sciences education | 2 | 0.7% |
| Turkish language education | 8 | 2.8% |
| History education | 3 | 1.0% |
| Physics education | 2 | 0.7% |
| Elementary Science education | 28 | 9.8% |
| Early childhood education | 30 | 10.5% |
| Fine arts education | 8 | 2.8% |
| Elementary education | 48 | 16.8% |
| English language education | 65 | 22.7% |
| Physical education and sports | 24 | 8.4% |
| Computer education | 17 | 5.9% |
| Psychological counseling | 6 | 2.1% |

Assumptions such as correlations above .30, Bartlett's Test of Sphericity, and Kaiser-Meyer-Olkin (KMO) value were taken into consideration for EFA (Hair et al., 2010). First, there were not any items that correlated with other items below.30 value. Moreover, Bartlett's Test of Sphericity result was significant ($\chi 2$ (351) = 5550.09, $p <$ .05), and the KMO value was.92 which was quite above the value of .50 (Field, 2009). According to Hair et al. (2010) sample size ($n$=286) was also acceptable to perform EFA.

Exploratory Factor Analysis (EFA) was performed using maximum likelihood analysis with direct oblimin rotation. Scree plot and eigenvalue criterion were checked out to find out the retained number of factors. The breakpoint of the plot displays a three-factor dimension for the scale in Figure 3.5.4.

**Figure 3.5.4**

*Scree plot of DGBL Perception Scale*




In addition, results demonstrated that 63.5% of the variance in data was explained by three factors structure of the scale with eigenvalues greater than one. In addition, Table 3.5.5 shows the factor loadings of items, and factor loadings ranged from .60 to .88.

**Table 3.5.5**

*Factor Loadings for the DGBL Perception Scale*

| | Factor Loadings | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Attitude1 | | | .74 |
| Attitude2 | | | .75 |
| Attitude3 | | | .80 |
| Attitude4 | | | .74 |
| Attitude5 | | | .71 |
| Selfefficacy1 | | .76 | |
| Selfefficacy2 | | .86 | |
| Selfefficacy3 | | .88 | |
| Selfefficacy4 | | .75 | |
| Selfefficacy5 | | .84 | |
| Perception2 | .60 | | |
| Perception3 | .67 | | |
| Perception4 | .63 | | |
| Perception5 | .69 | | |
| Perception6 | .71 | | |
| Perception7 | .81 | | |
| Perception8 | .79 | | |
| Perception9 | .75 | | |
| Perception10 | .78 | | |
| Perception11 | .76 | | |
| Perception12 | .75 | | |
| Perception13 | .83 | | |
| Perception14 | .61 | | |
| Perception15 | .60 | | |
| Perception16 | .68 | | |
| Perception17 | .72 | | |
| Perception18 | .65 | | |
| Eigenvalues | 13.50 | | |
| % of variance | 63.35 | | |

In addition, internal consistency estimated by Cronbach's alpha was .94 for the overall scale with .87.93 and .94 for attitude toward digital gaming, digital gaming self-efficacy, and perception of DGBL, respectively. That is to say, the results demonstrated satisfactory Cronbach's alpha values for all dimensions.

## 3.5 Research Variables in the Study

*Perceptions of the ICT strategies:* It is the predictor variable of the study with interval measurement scale. The SQD scale created by Tondeur et al. (2012) and translated into Turkish by Baran et al. (2017), was used to measure this variable. This scale is composed of six dimensions which are role model, instructional design, collaboration, reflection, authentic experience, and feedback.

*DGBL attitude*: It is the dependent variable of the study with interval measurement scale. DGBL attitude is defined as feelings or opinions of the pre-service teachers about the use of digital games in the classroom. It was measured with the DGBL scale (Hsu & Chiou, 2019).

*DGBL self-efficacy*: It is the dependent variable of the study with interval measurement scale. In this study, DGBL self-efficacy is defined as the beliefs of the pre-service teachers that they can effectively use digital games as a method of instruction as specified by their answers on the DGBL scale (Hsu & Chiou, 2019).

*Perceptions of DGBL*: It is the dependent variable of the study with interval measurement scale. In this study, perception of DGBL is defined as pre-service teachers' ideas about depending on their own experiences and examined with their responses on the DGBL scale (Hsu & Chiou, 2019).

## 3.6 Data Collection Procedures

As the first step of the data collection process, necessary permissions were received from METU Human Subjects Ethics Committee to prove that the study was not harmful to anyone in terms of any aspect. Immediately after taking the permissions, a pilot study was conducted with 286 pre-service teachers from different education faculty departments at universities in Ankara. It was taken into account that the

students in the pilot study had characteristics in common with the target population. Hence, the DGSL scale which was translated into the Turkish language by the research for the purpose of this study was included in the pilot study. Next, the main study was conducted in the second semester of the 2021-2022 academic year.

It took approximately 15 minutes for each participant to answer the questions in the scales. When the researcher went to the classes to administer the scales, all the participants were informed about the study in detail. Participants were also informed that they were requested to participate in the study voluntarily and they could withdraw from the study whenever they wanted to quit or felt uncomfortable with answering the questions. Moreover, it was stated to the participants that they would completely be anonymous, and the data collected from them would be confidential with no permission to anyone to have access to the data except the researcher. Next, the participants were invited to answer the questions in the scale carefully and sincerely. The researcher also stayed in the classroom until each participant finished answering the questions whether there were any parts that needed to be clarified or whether participants had any questions about the study in their minds.

### 3.7 Data Analysis

In order to answer the research questions, data analysis was carried out with regard to both descriptive and inferential statistics by using IBM SPSS 26. Before performing statistical analyses, the results of the Exploratory Factor Analysis and Cronbach's alpha coefficients were taken into consideration to check the psychometric characteristics.

Linear regression analysis is a method to assess a correlation between a criterion variable and a predictor variable (Fraenkel et al., 2015). Accordingly, for this correlational research study with 1 predictor variable, simple linear regression analysis was seen as the best option for data analysis.

First, it was necessary to specify the sample size suitable for linear regression. According to Tabachnick and Fidell (2020), the appropriate sample size for linear regression should be above 50 + 8m, where m stands for the number of predictor

variables. Hence, the appropriate sample size for the analysis was verified since the present study had 306 participants in total which was well above the lower limit. Additionally, the assumptions of linear regression analysis (normality, multicollinearity, homoscedasticity, linearity, and independent errors) were checked before conducting the analysis. Next, essential descriptive and inferential statistics for the purpose of this study were carried out.

Descriptive statistics were analyzed to determine the similarities and differences among the participants in terms of both gender and age by assessing the mean scores and standard deviations of the sample along with the frequency values.

### 3.8. Limitations of the Study

The present study has some limitations that need to be considered. First of all, since self-report measurements are used to gather data to examine the participants' perceptions, there is a possibility of participants' hiding their own real feeling because of a few concerns such as participants' giving more socially approved answers.

Next, since the study is a correlational study and investigates the relationship between preservice teachers' perceptions of using ICT strategies and DGBL, there is no cause-and-effect inferences. That is to say, relationship between the variables can be affected from the external variables which are not included in the current study.

Finally, the sample of the study is narrowed to the 3$^{rd}$ and 4$^{th}$ year pre-service teachers who are students at a state and well-established university in Ankara, and due to the problems related with taking permissions from the instructors because of their time limitations and busy schedules, there may be a problem with external validity. Therefore, the findings of this study cannot be generalized to other educational contexts.

### 3.9. Assumptions of the Study

The assumptions were made for the present study as follows: First, conditions were the same for all the participants during the data collection procedure. Participation of the entire participants based on voluntariness and there is no doubt about their answers

in terms of honesty and sincerity. During the data collection, each participant answers the questions independently without affecting each other's opinions or feelings. Finally, all the participants understand the questions and the statements in a correct way as intended by the instrument.

# CHAPTER 4

# RESULTS

## Results

### 4.1 Psychometric Properties of the Scales

#### 4.1.1 Validity and Reliability Analyses of Digital Game-Supported Learning (DGSL) Scale

In order to provide validity evidence for the DGBL Scale, a confirmatory factor analysis was performed over 26 items in the scale using maximum likelihood analysis.

According to Hair et al. (2010), an adequate sample size should be N/p ≥ 10, and in this data 306 participants were enough to meet the first requirement. Other assumptions such as Bartlett's Test of Sphericity and Kaiser-Meyer-Olkin (KMO) value were also examined. KMO value was .93 and Bartlett's Test of Sphericity result was also significant ($\chi 2$ (351) = 4682.22, $p < .05$).

Comparative Fit Index (CFI), Tucker Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA) fit indices were checked out. At first, the three-factor model of the DGBL scale did not fit well with the suggested model with the following fit indices: TLI = .82, CFI = .83, and RMSEA = .09. According to Hu and Bentler (1999) TLI and CFI values should be at least .90 for a moderate model fit while above .95 indicates a good fit. Moreover, RMSEA values between .05 and .08 show a mediocre fit of the model (Browne & Cudeck, 1993). Some error terms proposed by modification indices were permitted to covary in order to develop the model fit (e3-e4, e11-e12, e19-e20, e24-25). The results of CFA after this step showed the following fit indices, indicating a fair fit: CFI =.91, TLI=.90, and RMSEA =.07. Additionally,

the factor loadings of the retained items were significant and greater than 40 as it is suggested (Field,2020), except for item 42 with a factor loading of .21, all the items in the scale met the critical values criteria. Since it was found out in the literature that the statement mentioned in the item is quite related to the suggested factor, although its low factor loading, the item was decided to be kept in the scale (Alyaz & Genç, 2016; Kaimara et al., 2021).

The results of the reliability analysis showed that the value of Cronbach's alpha was equal to .93 for the whole scale with .81 for attitude, .84 for self-efficacy, and .93 for perception which were satisfactory values for internal consistency (Hair et al., 2010). Additionally, Table 4.1.1 shows the factor loadings of the three-factor structure.

**Table 4.1.1**

*Factor Loadings for the DGBL Scale*

| Item Numbers | Factor Loading | | |
|---|---|---|---|
| | Perception | Self-efficacy | Attitude |
| Item 19 | | | .78 |
| Item 20 | | | .57 |
| Item 21 | | | .50 |
| Item 22 | | | .40 |
| Item 23 | | | .64 |
| Item 24 | | .81 | |
| Item 25 | | .86 | |
| Item 26 | | .85 | |
| Item 27 | | .85 | |
| Item 28 | | .86 | |
| Item 30 | .70 | | |
| Item 31 | .75 | | |
| Item 32 | .73 | | |
| Item 33 | .84 | | |
| Item 34 | .79 | | |
| Item 35 | .73 | | |
| Item 36 | .80 | | |
| Item 37 | .75 | | |
| Item 38 | .78 | | |
| Item 39 | .76 | | |
| Item 40 | .59 | | |
| Item 41 | .83 | | |
| Item 42 | .21 | | |
| Item 43 | .70 | | |
| Item 44 | .62 | | |
| Item 45 | .59 | | |
| Item 46 | .43 | | |

### 4.1.2 Validity and Reliability Analyses of Synthesis of Qualitative Evidence (SQD) Scale

In order to provide validity evidence for the SQD Scale, confirmatory factor analysis was performed over 24 items in the scale using maximum likelihood analysis to examine the six-factor structure of the SQD Scale's Turkish version via Analysis of Moment Structures (AMOS 21.0) (Arbuckle, 2012). The scale was developed by Tondeur et al. (2016), and it was adapted to the Turkish language by Baran et al. (2017), and CFA was carried out to confirm the model specified by the researchers mentioned above.

Assumptions of CFA such as outliers, adequate sample size, and normality of variables were taken into account before executing the analysis. Since there were 300 participants in the dataset, it was enough to meet the criteria of adequate sample size (Hair et al., 2010). When Bartlett's Test of Sphericity and Kaiser-Meyer-Olkin (KMO) values were analyzed, it was seen that the KMO value was .92 and Bartlett's Test of Sphericity ($\chi$2 (276) = 7484.97 $p$ < .001) was significant as well. Additionally, multivariate normality was considered via skewness and kurtosis values. Since the values were between -2 and +2 as suggested by Hair et al. (2010) and Bryne (2010), multivariate normality was not violated in the dataset with the values ranging from -.53 to .86.

The SQD Scale's six-factor model with 24 items did not fit well with the suggested model. Results displayed lower scores than .90 as CFI .89 and NFI.86 with an RMSEA value of .11 which indicated a poor fit. Hence, the model was reduced to a one-factor model as defined by Tondeur et al. (2016) and Baran et al. (2017). 62.26% of the variance was explained by this one-factor structure. The factor loadings of the one-factor model are represented in Table 3.2 and the standardized regression weights were significant with values ranging from .64 to .90. Since each item correlated with the matching factor above .40, it was concluded that these items were good indicators of the factors.

**Table 4.1.2**

*Factor Loadings of Items for SQD Scale*

| Item | Standardized estimates |
|---|---|
| Item 1 | .70 |
| Item 2 | .72 |
| Item 3 | .73 |
| Item 4 | .64 |
| Item 5 | .69 |
| Item 6 | .80 |
| Item 7 | .80 |
| Item 8 | .77 |
| Item 9 | .78 |
| Item 10 | .71 |
| Item 11 | .80 |
| Item 12 | .80 |
| Item13 | .81 |
| Item14 | .73 |
| Item15 | .82 |
| Item16 | .81 |
| Item17 | .74 |
| Item18 | .80 |
| Item19 | .84 |
| Item 20 | .83 |
| Item 21 | .89 |
| Item 22 | .80 |
| Item 23 | .90 |
| Item 24 | .86 |

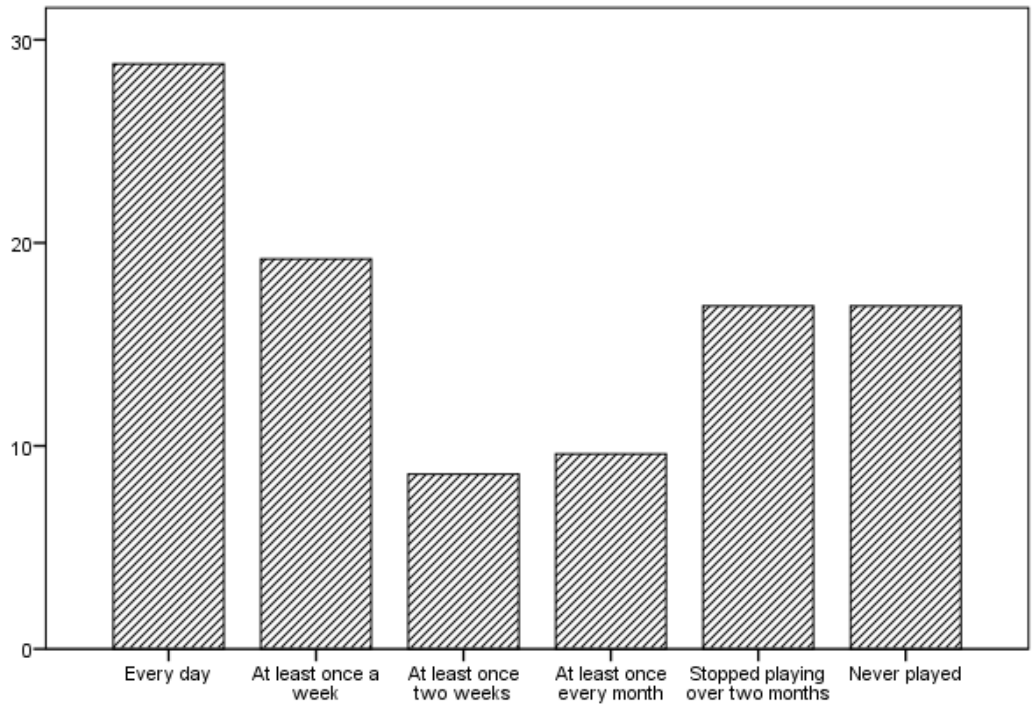
In addition, Cronbach's alpha value was calculated to evaluate the internal consistency of the SQD scale Cronbach's alpha value was .97 for the whole scale which showed adequate reliability of the scale since it requires to be over .7 (Fraenkel et al., 2015).

## 4.2 Results of Descriptive Statistics

Descriptive statistics were computed to examine the profiles of the pre-service teachers' in with regards totheir digital gaming experiences and perceptions of ICT strategies used in teacher education programs. First of all, among the participants, as can be seen from Figure 4.2 while 28.8% (*n*=87) of them play digital games every day, 16.9% never play any digital games (*n*=51). In addition, digital games are played at least once a week (*n*=58), at least once two weeks (*n*=26), at least once every month (*n*=29), and stopped being played over two months (*n*=51) by the participants.

**Figure 4.2**

*Frequency of Digital Game Playing*




The reason why participants do not prefer to play digital games is that 88.5% of the participants are not interested in digital games. Only 6 participants explained that they do not have enough time to play digital games. Of the sample, 12.6%, 55.1%, 24.0%, 6.7%, and 1.6% of the participants started to play digital games in kindergarten, elementary school, secondary school, high school, and university respectively.

Among the digital game platforms, mobile games (*n*=176), offline computer games (*n*=160), and online computer games (*n*=153) are the most preferred options by the participants, respectively. Moreover, while social games (*n*=156), are the games that participants often play, role-play games (*n*=73) are the ones least preferred. The places where participants often stay to play digital games are their own homes (*n*=241), friends' homes (*n*=79), dormitories (*n*=60), internet cafes (*n*=31), and on the move (*n*=51). While Friday (*n*=192), Saturday(*n*=226), and Sunday(*n*=200). were stated as the games that participants usually play digital games, the 20.00-22.00 (*n*=181) time period was the period the participants usually play the digital games. As can be seen from the table most of the participants play digital games for 0-5 36.4% (*n*= 92) and 6- 10 24.5% (*n*= 62) hours a week. 12.3% of the participants constituted the minority with 16-20 hours answers.

**Table 4.2.1**

*Spending time on playing digital games per a week*

| Playing time | *Frequency (f)* | *Percentage (%)* |
|---|---|---|
| 0-5 hours | 92 | 36.4 |
| 6-10 hours | 62 | 24.5 |
| 11-15 hours | 35 | 13.8 |
| 16-20 hours | 31 | 12.3 |
| More than 20 hours | 33 | 13.0 |
| Total | 253 | 100.0 |

When participants were asked whether they still play digital games now 81.5% (*n*=207) of them said yes 18.1% (*n*=46) said no. Results also displayed that participants play digital games for various reasons such as just for entertainment (*n*=196), for social reasons (*n*=103), to kill time (*n*=64), to stay away from the real world (*n*=55), and to make money(*n*=4). However, the participants who stopped playing digital games stated that lack of interest (*n*=28), lack of time(*n*=31), lack of money(*n*=3). and being not allowed to play (*n*=1) digital games were the reasons of stop playing.

In the perception of DGBL part, participants were asked whether they have ever had a chance to play educational digital games, 81.4% of them stated that they played

educational digital games before, while 18.3% of them stated that they never had a chance to play educational digital games. Moreover, while most of the participants 95.1% (*n*=2911) were willing to use educational digital games in the future as prospective teachers, only 14 of the participants were reluctant to include educational digital games in their classrooms. Additionally, being involved in the educational digital game design was a good idea for 86.9% of the participants, however, 12.7% of them were not disposed to design digital games for educational contexts.

As can be seen from table 4.2.1, mean scores and standard deviations of six ICT dimension are given separately as role model, reflection, instructional design, collaboration, authentic experiences and feedback.

**Table 4.2.2**

*Descriptive Statistics for SQD Scale Dimensions*

| Dimensions | *M* | *SD* |
|---|---|---|
| ICT Strategies[1] | | |
| Role Model | 2.52 | 1.02 |
| Reflection | 2.50 | 1.15 |
| Instructional Design | 3.15 | 1.20 |
| Collaboration | 2.68 | 1.20 |
| Authentic Experiences | 2.90 | 1.15 |
| Feedback | 3.01 | 1.32 |

*Note*. [1]Ratings were on a six-point Likert type scale

While the mean score was the lowest for reflection (*M* = 2.50, *SD* = 1.15), it had the highest score for instructional design (*M* = 3.15, *SD* = 1.20). Among the other dimensions, mean value of role model (*M* = 2.52, *SD* = 1.02) was almost as high as the reflection. It was followed by collaboration (*M* = 2.68, *SD* = 1.20), authentic experiences (*M* = 2.90, *SD* = 1.15) and feedback(*M* = 3.01, *SD* = 1.32) respectively.

**Table 4.2.3**

*Descriptive Statistics for SQD Scale Items*

| Items of SQD Scale | *M* | *SD* |
|---|---|---|
| 1. Bilgi ve iletişim teknolojilerinin eğitim ortamında kullanımına yönelik pek çok örnek gördüm. | 2.24 | 1.07 |
| 2. Bilgi ve iletişim teknolojilerini gelecekte eğitim uygulamalarıma entegre edebilmek için yeteri kadar gözlemledim. | 2.63 | 1.19 |
| 3. Bilgi ve iletişim teknolojileri uygulamalarının sınıfımda kullanmama ilham veren iyi örneklerini gördüm. | 2.40 | 1.23 |
| 4. Eğitimde bilgi ve iletişim teknolojilerinin kullanılma potansiyeli somut bir şekilde gösterildi. | 2.83 | 1.21 |
| 5. Bilgi ve iletişim teknolojilerinin eğitimdeki rolünü yansıtma olanağı sağlandı. | 2.72 | 1.24 |
| 6. Bilgi ve iletişim teknolojilerini eğitime entegre etmenin zorluklarını tartıştık. | 2.40 | 1.32 |
| 7. Bilgi ve iletişim teknolojilerinin sınıf ortamında kullanımına yönelik deneyimlerimizi tartışma fırsatı verildi. | 2.52 | 1.44 |
| 8. Eğitimde bilgi ve iletişim teknolojilerine yönelik genel tutumumuzu tartıştığımız belirli zamanlar oldu. | 2.40 | 1.36 |
| 9. Bilgi ve iletişim teknolojilerinin entegre edildiği ders tasarlama konusunda yeterli destek aldım. | 2.93 | 1.35 |
| 10. Bilgi ve iletişim teknolojilerini derslere nasıl entegre edebileceğimizi en ince ayrıntısına kadar öğrendik. | 3.70 | 1.39 |
| 11. Eğitim materyalleri geliştirirken bilgi ve iletişim teknolojilerinin kullanımına yönelik yardım aldık. | 2.74 | 1.29 |
| 12. Staj dönemimde kullanmak üzere bilgi ve iletişim teknolojileri ile zenginleştirilmiş dersler ve projeler geliştirmek için epey yardım aldım. | 3.25 | 1.43 |
| 13. Diğer öğretmen adaylarıyla eğitimde bilgi ve iletişim teknolojilerinin kullanılmasına yönelik çalışabilmem için yeterli zamanlar oldu. | 3.07 | 1.51 |
| 14. Eğitimde bilgi ve iletişim teknolojilerinin kullanımına ilişkin iş birliğinin önemine ikna oldum. | 2.40 | 1.25 |
| 15. Eğitim bağlamında bilgi ve iletişim teknolojilerinin kullanımı konusunda öğretmen adayları birbirlerine yardımcı oldu. | 2.80 | 1.35 |
| 16. Eğitimde bilgi ve iletişim teknolojilerin kullanımı deneyimleri paylaşıldı. | 2.50 | 1.35 |
| 17. Sınıfta bilgi ve iletişim teknolojilerinin farklı kullanımlarını test etmem için yeterli zamanlar oldu. | 3.24 | 1.01 |
| 18. Staj dönemim boyunca bilgi ve iletişim teknolojilerinin sınıfta kullanımını öğrenebildim. | 3.07 | 1.43 |
| 19. Bilgi ve iletişim teknolojilerinin sınıf ortamında kullanımında deneyim kazanmak için teşvik edildim. | 2.54 | 1.24 |
| 20. Öğretmen adayları olarak eğitim ortamında bilgi ve iletişim teknolojilerini kullanmak için girişimde bulunduğumuzda teşvik edildik. | 2.53 | 1.31 |
| 21. Derslerimde bilgi ve iletişim teknolojilerinin kullanımı hakkında yeterli geribildirimi aldım. | 2.80 | 1.35 |
| 22. Bilgi ve iletişim teknolojileri yeterliklerim ayrıntılı bir şekilde değerlendirildi. | 3.50 | 1.37 |
| 23. Bilgi ve iletişim teknolojileri yeterliklerimi nasıl daha fazla geliştirebileceğim konusunda yeterli geribildirim aldım. | 2.90 | 1.42 |
| 24. Sınıfta bilgi ve iletişim teknolojilerinin kullanımı yeterliklerim düzenli olarak değerlendirildi. | 3.00 | 1.52 |

24 items in the SQD scale were descriptively analyzed to their mean scores and standard deviations. While item 1 has the lowest mean value with 2.24 (*SD*= 1.07), item 10 has the highest mean score with 3.70 (*SD*= 1.39). Moreover, when compared to the other items in Table 4.2.3 item 22 has also quite higher mean value than the others (*M*= 3.50, *SD*= 1.37).

## 4.3 Results of Simple Linear Regression Analyses

In the current study, three simple linear regression analyses were performed to investigate the extent of DGBL integration into education in terms of attitude, self-efficacy, and perception from the predictor obtained from the SQD scale.

### 4.3.1 Assumptions of Simple Linear Regression Analysis

Before performing the analysis there are some assumptions that need to be taken into consideration such as sample size, absence of outliers, normality, linearity, homoscedasticity, and independence of residuals (Tabachnick & Fidell, 2020). First, according to Tabachnick and Fdell (2020), to perform linear regression analysis $N \geq 50 + 8m$ (m= number of IVs). Hence, considering the formula sample size should be more than 98 since this study includes 306 participants in total there is no problem with the sample size for three of the analyses.

There are four assumptions to take into consideration before running the simple linear regression analysis: linearity, homoscedasticity, independence, and normality (Tabachnick & Fidell, 2020). Histograms, scatterplots, and normal probability plots were used to check normality, linearity, homoscedasticity, and independence of residuals.

The histogram showed that the residuals were roughly normally distributed. When the residual scatterplot was examined, it was seen that there were not any curvilinear relations. Hence, the horizontal-line relationship of the predictor and outcome variable met the linearity assumption. In order to understand whether the residuals were distributed equally, the scatterplot was examined. Since the data did not have a specific pattern with an equal distribution of the points all over the plot when 0 points were

thought as the central points for both the X and Y axis, it was found that there was not any violation of the homoscedasticity assumption as well.

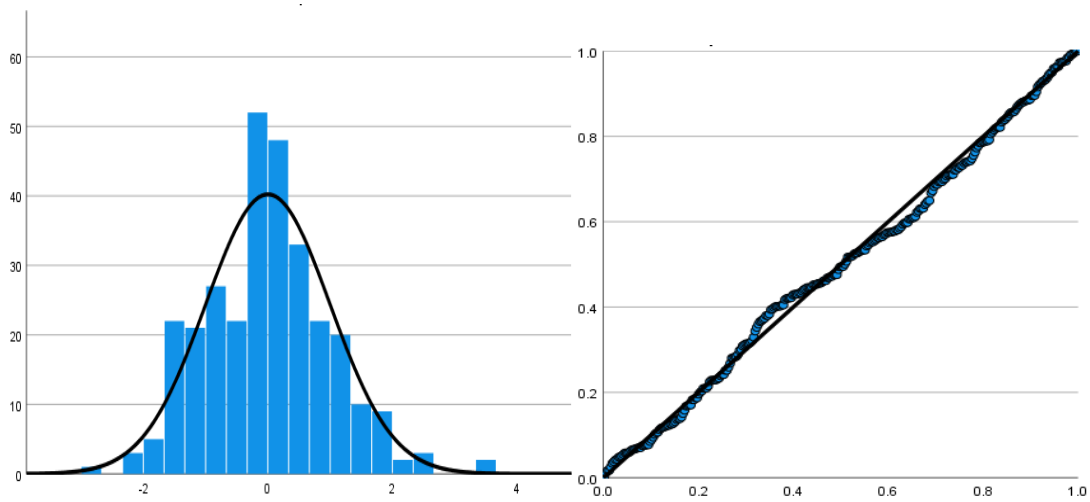



**Figure 4.3** *Histogram and Normal P-P Plot for Attitude towards Digital Gaming*

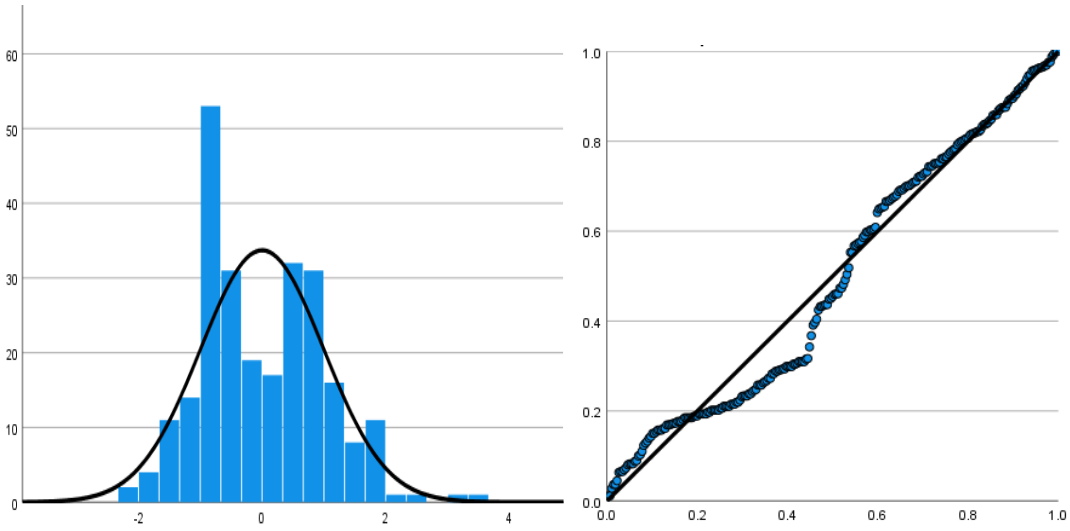



**Figure 4.4** *Histogram and Normal P-P Plot for Digital Gaming Self-efficacy*

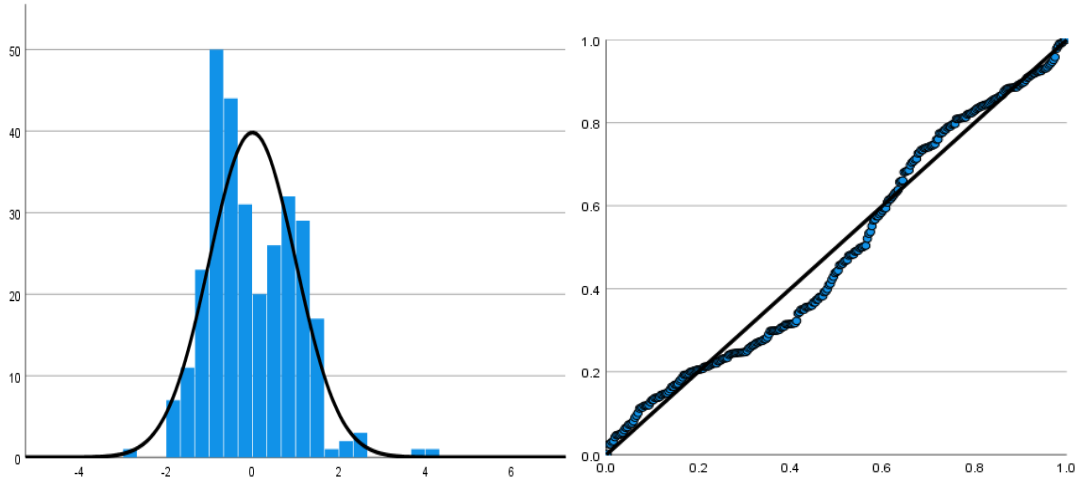



**Figure 4.5** *Histogram and Normal P-P Plot for Perception of Digital Gaming*

### 4.3.2 Intercorrelations among the predictor and dependent variables

Before performing linear regression analyses, correlations among the perceptions of ICT strategies and the dependent variable were analyzed. Table 4.3.2 presents the correlation matrix of DGBL perception with the predictor variable together with correlation among the dependent variables.

**Table 4.3.2**

*Intercorrelations of the Variables*

| Predictor Variable | 1 | 2 | 3 |
|---|---|---|---|
| ICT Perception | .38 | .37 | .50 |
| Dependent Variables | | | |
| 1. DGBL Attitude | -- | | |
| 2. DGBL Self-efficacy | .42 | -- | |
| 3. DGBL Perception | .51 | .51 | -- |

### 4.3.3 Findings of Simple Linear Regression Analysis 1

In this study, a simple linear regression analysis was calculated to predict the attitude of DGBL as the dependent variable, based on the perceptions of strategies used to prepare pre-service teachers for ICT integration as an independent variable. Information about the unstandardized regression coefficients (B) and intercept, the standardized regression coefficients (SEB), the semi-partial correlations (sr 2), $R^2$, and adjusted $R^2$ was acquired as a result of the regression analysis.

**Table 4.3.3**

*Linear Regression Analysis Summary for Attitude towards DGBL*

| Variable | *B* | *SEB* | *β* | *t* | *sr2* |
|---|---|---|---|---|---|
| Constant | 7.10 | .47 | | 15.17 | .00 |
| ICT | .10 | .01 | .38 | 7.09 | .00 |

Moreover, a significant regression equation was found $F$ (1, 300) = 50.20 $p$<.001, with an $R^2$ of .14. Participants' predicted attitudes toward DGBL increased .1 for each increment in their perceptions. The results of the regression displayed that the model explained 14.3% of the variance. Hence, it was found out that ICT perceptions significantly predicted the participants' attitudes toward DGBL ($\beta 1 = .10$, $p<.001$)

### 4.3.4 Findings of Simple Linear Regression Analysis 2

The present study used a simple linear regression analysis to test if the perceptions of strategies used to prepare pre-service teachers for ICT integration significantly predicted DGBL self-efficacy. Table 4.3 presents statistics about the unstandardized regression coefficients (B) and intercept, the standardized regression coefficients (SEB), the semi-partial correlations ($sr^2$), $R^2$, and adjusted $R^2$.

**Table 4.3.4**

*Linear Regression Analysis Summary for DGBL Self-efficacy*

| Variable | *B* | *SEB* | *β* | *t* | *sr2* |
|---|---|---|---|---|---|
| Constant | 5.20 | .52 | | 10.07 | .00 |
| ICT | .10 | .01 | .37 | 6.25 | .00 |

The ANOVA results indicated that the linear regression model provided a significant improvement over the default model based on the mean of DGBL self-efficacy scores, $F$ (1, 251) = 39.02 $p$<.001 with an $R^2$ of .14. The R square value was equal to .14 and it demonstrates that 14% of the variability related to self-efficacy of DGBL is predicted by ICT integration dimensions. Therefore, it was concluded from the results of the regression that ICT perceptions significantly predicted the participants' attitudes toward DGBL (β1 = .10, p<.001). Additionally, since the 95% confidence intervals of the independent variables did not include zero, their significance was approved.

### 4.3.5 Findings of Simple Linear Regression Analysis 3

A simple linear regression analysis was used to predict the perceptions of DGBL from the perceptions of strategies used to prepare pre-service teachers for ICT integration. The values of unstandardized regression coefficients (B) and intercept, the standardized regression coefficients (SEB), the semi-partial correlations (sr 2), $R^2$, and adjusted $R^2$ can be reached in table 4.3.5.1 below.

**Table 4.3.5**

*Linear Regression Analysis Summary for Perception of DGBL*

| Variable | *B* | *SEB* | *β* | *t* | *sr2* |
|---|---|---|---|---|---|
| Constant | 17.75 | 1.19 | | 14.98 | .00 |
| ICT | .16 | .02 | .50 | 9.89 | .00 |

The ANOVA results indicated that the participants' perception of using ICT strategies explained a significant amount of the variance in perceptions of DGBL, $F$ (1, 297) = 97.82 $p$<.001 with an $R^2$ of .25. The adjusted R square value was equal to .25 and it demonstrates that %25 of the variability related to self-efficacy of DGBL is predicted by ICT integration dimensions. Hence, it was obtained from the findings of the regression that a quarter of the variance in perceptions of DGBL can be explained by ICT perceptions ($\beta 1 = .16$, $p<.001$).

### 4.4 Summary of the Results

This study aimed to examine the effect of preservice teachers' perceptions of strategies to prepare future teachers for technology use in the future including taking teacher educators as role models, reflecting on technology integration in the classroom, preparing instructional designs including technology, collaboration to improve the success of technology integration among pre-service teachers, implementing the knowledge about technology in authentic environments which is called experience, and taking feedback during the whole process on the perception of DGBL with three dimensions: attitude, self-efficacy, and perception. Data was collected from 306 pre-service teachers who were in their 3rd or 4th years, and data collection instruments were composed of the DGBL perception scale and SQD scale.

Results of the descriptive statistics shed light on the fact that the number of pre-service teachers that played digital games at least at once in their lives was at a high level when compared to the ones who never played. Moreover, more than two-thirds of the participants keep playing digital games at least once a month. It was also seen from the results of descriptive statistics that participants liked to play mobile games the most and followed by both online and offline computer games. Almost half of the participants stated that they spend at most 10 hours playing digital games in a week, and this gameplay time is mostly on weekends. When they were asked about why they play or do not play digital games, it was stated that the reason why participants did not prefer to play digital games was mainly because of a lack of interest, on the other hand, the reasons for playing digital games were just entertainment and social reasons. Furthermore, in terms of educational digital games, the number of experiences with

educational digital games was at a high level. Even if they had a chance to play educational games or not almost every participant stated that they were willing to include educational digital games in their lessons although not all of them leaned to be part of designing educational digital games.

Moreover, findings of the descriptive results related to the dimensions of SQD scale which were six ICT strategies that should be included in teacher education programs to improve technology integration, it was seen that reflection was the strategy that the pre-service teachers in this study experienced the most during their education followed by reflection. While the participants also had chance to collaborate with other students, and had experiences related to the technology integration, the scores of their answers were lower for the feedback. However, the lowest scores belonged to the instructional design, and participants had the lowest scores with item 10 indicating that they learned how to integrate ICT into their lessons in detail when they design lesson plans.

Results of the regression analyses revealed that ICT strategies used in teacher education programs were strong predictors of attitude, self-efficacy, and perception toward DGBL. In the end, it was found that ICT perception predicted the dependent variables which were attitude, self-efficacy, and perception respectively 14%, 14%, and 25% of the variability. It can be deduced from the results that pre-service teachers who had role models during their education, were given chance to reflect on their own ICT use, tried to design materials including technology use, had a chance to work in teams and helped each other, had time to experience real use of technology rather than only theoretical knowledge and got feedback for the whole process, were more likely to think about including DGBL in their lessons in the future with positive attitudes, high level of self-efficacies and positive perceptions. Hence, depending on the direction and the size of the relationship it can be concluded that perceptions of ICT strategies used in education have a positive and significant effect on preservice teachers' perception of using DGBL.

# CHAPTER 5

# DISCUSSION

## 5.1. Conclusion of the Results

With the improvements in the number of digital games and players, DGBL has started to become a widespread method in educational contexts, and there are two important reasons behind the increase in DGBL. First of all, the characteristics of the students have changed throughout the years since they are the generation who were born into technology, and their lives are full of technology either for entertainment or daily work. As a result of this change in daily lives, their way of understanding, acquiring, and interpreting knowledge is quite different from the previous generations (Prensky, 2001). Hence, with these developments in students' life teachers' point of view against technology and digital games has also begun to change as the second reason mentioned above. Since teachers are the essential points of the teaching process at schools, communication between teachers and students is very critical. That is why teachers need to be prepared to meet the needs of the digital natives by being aware of the new technological materials and teaching methods (Almerich et al., 2016; Kaimara et al., 2021; Prensky, 2001). In light of the awareness of the importance of technology integration for education, this study searched for an answer to the influence of preservice teachers' perceptions toward the use of ICT strategies during their bachelor's education on their perceptions of DGBL.

The results of the descriptive statistics of the current study clarified that the number of pre-service teachers who play digital games in their daily lives was higher than the ones who do not have experience in playing them, and almost all of the gamer participants play digital games with a frequency of at least once a month. While digital

games are played for having fun and spending time with friends, the cause of they are not played by the other participants is their being not attractive to the participants. Additionally, the results of the questions related to the integration of educational games revealed that most of the participants had a positive attitude toward including them in the educational context even if they did not play digital games in their leisure time. They were also eager to be a part of designing these kinds of digital games.

When it comes to the findings of the descriptive statistics of ICT strategies used in teacher education programs, pre-service teachers had a chance to have appropriate role models to observe a good example of technology integration. Moreover, the results also showed that the participants had some time to discuss the integration of technology including the possible barriers and opportunities of it. However, in terms of getting help about how to design lessons with ICT, and how can integrate it into their lessons and materials the participants' perceptions about the instructional design were not as positive as the other strategies. On the other hand, it was concluded from the results that the level of collaboration among the students was quite high, and they tried to help each other to promote their technology integration skills. Additionally, pre-service teachers experienced ICT in various ways by trying to use it in classroom environments. However, it was seen that feedback is the other strategy that was not used as often as the other strategies by the education program of the participants in this study since they thought that they did not get enough feedback about their micro teachings with technology integration skills or how they could improve themselves about the weak parts of their technology use competences.

When teacher educators are thought as role models for technology integration, it was concluded that role models are an essential source of inspiration for pre-service teachers with positive association. In parallel with the results of this study, Kaufman (2014) stated that education is a dynamic field that changes constantly so that teachers should be able to adjust themselves to the innovations and never stop improving. Technology use in education is one of the important developments in recent times. Hence, teachers should have technical knowledge about it along with the creative use of technology. In this way, they can be good examples of effective technology use. Similarly, when the recent studies in the literature were taken into consideration, it was

revealed by some studies that ICT integration is an inevitable part of the teaching process and having good examples of effective use of technology impact pre-service teachers' perception of DGBL in a good way (DeCoito & Richardson, 2018; Donitsa-Schmidt & Ramot, 2020; Scull et al., 2020; Voogt & McKenney, 2016). Moreover, reflection is also another important strategy for technology integration. Having a chance to think about the effective use of technology, observing other models, trying to implement what is thought to be effective, and finally reflecting on their own works and performances are beneficial for the future of pre-service teachers. Reflection also enables students to think critically and have a wider point of view about the opportunities of technology (Mouza et al., 2014; Petersen & Oliveira, 2017). Belda-Medina and Calvo-Ferrer (2022) conducted a study to investigate the attitudes and knowledge of pre-service teachers about DGBL. Data was collected from 154 pre-service teachers via pre/posttest, presentation of digital games, and student blogs. Researchers mainly focused on stages of critical thinking skills which are definition, selection, demonstration, discussion, and reflection. During the study, participants were expected to talk about digital games, find good examples of them and assess the digital games as well as write reflections on their blogs. After a month of this process with digital games and regular reflections about them, it was concluded from the results that preservice teachers' attitudes became more positive than before. These studies suggested quite similar results to the present study since both of them stated a significant relationship between ICT strategies and improvement of positive perception toward DGBL.

Since working in a group makes the students more confident and feel safe, the pre-service teachers' perceptions are affected in a good way. When the concern of making a mistake decreases as the collaboration increases (Yang et al., 2021). In a study, students were given a collaborative educational game that requires them to work together to be successful, and it was seen that it did not only help students to improve their learning but also collaboration increased their motivation, self-efficacy, and success at the end of the learning process via the game (Sung & Hwang, 2013). Similarly, another study conducted by Liao et al. (2019) displayed parallel results with the present study. The study was conducted with 109 participants to see the effect of instructional video and collaboration on students' success, motivation, cognitive load,

and learning performances. It was concluded that collaboration could increase the level of motivation while it decreased the level of cognitive load at the same time. Hence, students' perceptions changed in a positive way after the instructional video and collaboration experience.

Rather than only acquiring theoretical knowledge, having a chance to apply what they learn during the lessons is important to have authentic experiences as pre-service teachers (An, 2018; Tondeur et al., 2016, Valtonen et al., 2015). A study conducted by Gudmundsdottir and Hatlevik (2017) revealed that even if pre-service teachers are asked to use technology effectively, the education they get during their university years and the real experience they obtain is not at the level of anticipation. Accordingly, this situation creates an inconsistency between the expectations and reality by affecting pre-service teachers' attitudes for the coming years. Moreover, it was also seen from the results of another study that the frequency of using technology and how it is used by pre-service teachers are mostly dependent on the education get in teacher education programs. Since most of the students have the opportunity to turn their knowledge into practice after they graduated, it becomes difficult for them to adjust to the instructional technologies and new teaching methods like DGBL (Admiraal et al., 2016). Results of another study conducted with 32 teachers in Canada displayed the differences in teachers' perspectives before and after the experiences of DGBL. Even if almost all of the teachers used technology in their daily lives effectively, most of them did not have enough knowledge about how to integrate it into the teaching process or digital games. However, after taking a professional development workshop they had a chance to experience the successful use of DGBL and how it could be effective. After spending some time improving themselves in technology integration, their way of thinking about technology use in the classroom changed significantly. In total, the authors agreed that creating favorable circumstances may prepare the ground for more technologically advanced classrooms. What is more, another study conducted by Alyaz and Genç (2016) revealed the importance of having experience as mentioned in this study. They aimed to provide foreign language pre-service teachers necessary knowledge to use DGBL in their future classrooms. Participants were given pre and post-tests before and after their experience of digital games. In the end, the results

showed that there was a significant development in their perceptions of the DGBL, and most of them stated that they will be using digital games in the future as teachers.

As the last strategy of ICT integration, if pre-service teachers get sufficient feedback about their technology competencies on a regular basis, the probability to improve their potential of using ICT strategies in the classroom also increases. The findings were in parallel with the study of Erhel and Jamet (2013) that students' performance and motivation can be increased via continuous feedback during learning. Moreover, they found out that feedback can help learners to decrease unnecessary cognitive processes by guiding learners to find the correct way to reach the target. In addition, there are some other studies that put emphasis on the feedback in terms of learners' performance, motivation and impact of converting knowledge into other circumstances (Anastasiadis et al., 2018; Corbalan et al., 2009; Mayer & Johnson, 2010; Yang, 2017). Another study conducted with 383 participants displayed that using information feedback can lead to learning becoming more effective and increase participants' enthusiasm to use DGBL (Liu et al., 2020) in parallel with the results of this study.

Results of the linear regression analyses of this study confirmed that perceptions of pre-service teachers toward the use of ICT strategies was found to be a significant predictor of perceptions of DGBL, attitude towards DGBL, and digital gaming self-efficacy. That is to say, as suggested by the findings of this study when technology integration is seen as a crucial part of instruction, the probability of including digital games can also increase with a positive perception. Moreover, in parallel with the results of this study, Kaufman (2014) stated that education is a dynamic field that changes constantly so that teachers should be able to adjust themselves to the innovations and never stop improving. Technology use in education is one of the important developments in recent times. Hence, teachers should have technical knowledge about it along with the creative use of technology. In this way, they can be good examples of effective technology use. Similarly, when the recent studies in the literature were taken into consideration, it was revealed by this study and some other studies that ICT integration is an inevitable part of the teaching process and having good examples of effective use of technology impact pre-service teachers' perception

of DGBL in a good way (DeCoito & Richardson, 2018; Donitsa-Schmidt & Ramot, 2020; Scull et al., 2020; Voogt & McKenney, 2016).

Since attitudes are one of the important components of DGBL perception (Baturay et al., 2017; Voulgari et al., 2020) , the relationship between technology integration strategies and attitudes was also examined, and ICT strategies were found to be significant for digital gaming attitudes. Similarly, Belda-Medina and Calvo-Ferrer (2022) conducted a study to investigate the attitudes and knowledge of pre-service teachers about DGBL. Data was collected from 154 pre-service teachers via pre/post test, presentation of digital games, and student blogs. Researchers mainly focused on stages of critical thinking skills which are definition, selection, demonstration, discussion, and reflection. During the study, participants were expected to talk about digital games, find good examples of them and assess the digital games as well as the use of various technology integration methods. After a month of this process with digital games and regular reflections about them, it was concluded from the results that preservice teachers' attitudes became more positive than before. The results also parallel with the findings of An and Cao (2016) in terms of the idea that experience with technology integration strategies is a significant predictor of attitudes towards DGBL. Moreover, Ray and Coulter (2010) and Kenny and McDaniel (2011) also had similar results in this study that attitudes of pre-service teachers were closely related to their use of technology integration skills. What is more, the results of other studies (Kennedy-Clark et al., 2013; Sardone & Devlin-Scherer,2010) are worthy of comparison since they also found out that the attitudes of the participants changed in a positive way with the increase in the levels of authentic experience, collaboration, design and reflection which were the ICT strategies mentioned in this study. Furthermore, depending on their level of being exposed to the technology integration strategies during their teacher education, the way how pre-service teachers see digital games also changed in parallel with a study by Gibson et al. (2007). Whenever pre-service teachers' level of perception of ICT strategies used in teacher education programs was high, their attitudes toward digital games as educational tools were also more positive. On the contrary, there are some studies in comparison with the results of this study that even if pre-service teachers had little experience with technology integration during their university education, the attitude of these participants toward

digital games was quite positive, and they indicated that they would use them in their lessons.

DGBL self-efficacy is another dimension of DGBL perception tested for the purpose of this study. The results displayed that technology integration strategies used in teacher education programs to prepare pre-service teachers were significantly associated with the self-efficacy levels of the participants. A study conducted by An (2018) showed that the digital gaming self-efficacy levels of the participants increased significantly after they took a professional development course which included strategies to promote technology integration in the classes similar with the results of this study. Similarly, the study of Wang et al. (2004) revealed that experiences with authentic technology integration strategies were significant predictors of digital gaming self-efficacy. It was experimental research and participants were tested with pre and post surveys. It was found out that there was a significant difference between before and after their having a chance to improve their technology integration skills. An and Cao (2016) also used similar ICT strategies in their studies to test the self-efficacy of the participants. During the study, participants were expected to design materials, collaborate with friends, give feedback on each other's designs, reflecting on their own projects, and these were the same as the SQD model described in this study. Similarly, the results of this study also highlighted the importance of the relationship between technology integration skills and DGBL.

As the last dimension of DGBL, the study found out that ICT strategies for technology use was the most significant predictor of perception of DGBL. It means that when the participants' scores of perceptions of ICT strategies were high, their level of perception of including DGBL was also high. Some studies had similar results to the findings of this study indicating that when pre-service teachers had a chance to experience technology integration via various strategies during the time they spend in teacher education programs, their perception of using DGBL also evolved in a positive way (Casillas Martín et al., 2019; Koh et al., 2012; An et al., 2016; Denham et al. 2016; Gaudelli & Taylor, 2011). It was also concluded from the literature that perception of pre-service teachers had an influence on their probability of using DGBL in the future (Akkaya et al., 2021; Hayak & Avidov-Ungar, 2020) so that depending on the positive

relationship between the experience of technology integration strategies and DGBL, the probability of including digital games in the classroom can be increased with the education of technology integration skills. Moreover, a study of Dickey (2015) had comparable results with the findings of this study. While the participants who had an experience of various technology integration strategies had higher scores of perceptions towards the use of digital games for educational purposes, the ones who had not too much experience with technology integration experiences during their education were more skeptical about the value of the games as instructional tools. Similar to this study, Huizenga et al. (2017) conducted a study with teacher educators who used DGBL in their lessons, and the results revealed that the reason behind why they preferred to use it as a teaching method was their experience of technology use and improvement of technology integration skills via the education they get when they were students. Another study conducted with 125 university students showed that pre-service teachers' perceptions of using DGBL were closely related to the education program they were involved in and their educators at the university. It was seen that the more they had chance to see different use of technology for educational purposes, the more their perceptions changed positively. In parallel with the results of this study, having no experience with the use of technology integration strategies during the teacher training programs can lead to some problems related to the use of DGBL with a negative impact on their perception of digital games (Kaimara et al., 2021; Koh et al., 2012).

All in all, the present study confirmed that perceptions of pre-service teachers toward the use of ICT strategies play a significant role in determining perceptions of DGBL, attitude towards DGBL, and digital gaming self-efficacy. This study also found out that reflection and role models were the most used strategies to prepare pre-service teachers to use technology in teacher education programs. Working in teams, helping each other and activities that require collaboration to use ICT, and authentic experiences that give pre-service teachers to test various ways of ICT use by taking advantage of the knowledge they acquired during their courses are the other common practices. It was also found out that teacher educators and other role models that pre-service teachers had a chance to observe were among the significant determinants of students' perceptions. However, the level of using instructional design and feedback

strategies defined in the SQD model was lower than other strategies. Considering all together, it can be concluded that the more the strategies for the use of ICT in education determined in the SQD model applied, the more positive changes in pre-service teachers' perceptions of DGBL can be monitored.

## 5.2. Implications for Practice

The present study intended to investigate the ICT strategies used in teacher education programs and how well they predicted the perception of pre-service teachers. The findings of the study revealed that the effect of perceptions about ICT strategies have a positive relationship with perceptions toward DGBL. Therefore, the results of this study came up with some suggestions that may be beneficial for both teacher educators and pre-service teachers.

First of all, it is worth to keep in mind that the implementation of any new technology is closely associated with teachers' perceptions of it. If the new teaching method or material is not seen as a crucial point for teaching by the teachers or teachers do not become familiar with it because of internal and external limitations, the chance to use new methods in the classroom will be quite low. Hence, preparing teachers with an awareness of the importance of technology should be one of the essential parts of teacher education programs.

Furthermore, since feedback and instructional design were the strategies that were experienced least by the participants of this study, some arrangements in teacher education programs can be made. For instance, if pre-service teachers get sufficient feedback about their technology competencies on a regular basis, the probability to improve their potential of using ICT strategies also increases in the classroom so that their perception of technology integration and DGBL inclusion can increase in the same way. Moreover, it was found out that feedback can help learners to decrease unnecessary cognitive processes by guiding learners to find the correct way to reach the target (Erhel & Jamet, 2013). In addition, it should also be kept in mind that putting emphasis on the feedback may have positive effects on learners' performance, motivation and impact of converting knowledge into other circumstances (Anastasiadis et al., 2018; Corbalan et al., 2009; Mayer & Johnson, 2010; Yang, 2017).

Moreover, students should be given more chances to apply what they learn to their lesson plans. They should be provided with opportunities to design lessons with technology integration with the support of teacher educators, and they should learn how they can take advantage of these lesson plans.

Even if the perceptions of pre-service teachers towards the use of other ICT strategies which are role models, reflection, collaboration, and authentic experiences were more positive, there are also some points that need to be taken into consideration by teacher education programs. Since role models are essential sources of inspiration for pre-service teachers with positive association the perspectives of teacher educators should be given primary importance. Having a chance to think about the effective use of technology, observing other models, trying to implement what is thought to be effective, and finally reflecting on their own works and performances are beneficial for the future of pre-service teachers. Laying emphasis on reflection in teacher education can also enable students to think critically and have a wider point of view about the opportunities of technology (Mouza et al., 2014; Petersen & Oliveira, 2017). Moreover, since working in a group makes the pre-service teachers more confident and feel safe, their perceptions can be affected in a good way so that concern about making a mistake decreases as the collaboration increases. As the last strategy of ICT, authentic experiences are quite significant for pre-service teachers. Even if teacher education programs provide them with necessary information about the importance of technology use in the classroom, if this knowledge only stays as theoretical knowledge without experiencing it, the possibility of learning it completely would decrease a lot. Hence, as prospective teachers, students should be given chances to transform and apply what they learn in their lessons to real teaching environments.

Since the children spend most of their time online when they are not at school, including strategies to improve technology use for teachers became so important. Hence, teacher education programs should promote technology integration for education as well. Otherwise, the discrepancy between teachers and students can arise with the inexperience of pre-service teachers. If teachers are given opportunities to see the importance and potential of technology via the education they get at the university, the probability of using it can also increase with various ways.

As presented in the results of a study conducted by Mouza et al. (2014), teacher education programs pre-service teachers are not given enough chance to experience designing technology-enhanced lessons or materials, and they get little feedback about the work they completed. Therefore, they should be given continuous feedback, a chance to design their own materials, reflect on their studies, collaborate with their friends, and take good examples as role models with the guidance of teacher educators. That is to say, to increase the level of DGBL use, micro-level technology integration strategies defined in SQD models can be added to teacher education programs. However, only including these strategies is not enough for the effective development of technology use skills, how they are applied is also another important point. Hence, the quality and diversity of the activities to promote technology integration should also be taken into consideration.

Even if pre-service teachers are asked to use technology effectively, the education they get during their university years and the real experience they obtain is not at the level of anticipation. Accordingly, this situation creates an inconsistency between the expectations and reality by affecting pre-service teachers' attitudes for the coming years. Moreover, it was also seen from the results of a study that the frequency of using technology and how it is used by pre-service teachers are mostly dependent on the education get in teacher education programs. Since most of the students have the opportunity to turn their knowledge into practice after they graduated, it becomes difficult for them to adjust to the instructional technologies and new teaching methods like DGBL (Admiraal et al., 2016). Hence, creating favorable circumstances may prepare the ground for more technologically advanced classrooms (Hébert et al., 2021).

Moreover, it is not enough for pre-service teachers to acquire skills to use technology effectively, instead, they should know how they can combine technology with their teaching. To achieve this goal, pre-service teachers should raise awareness about how they can include new technology-enhanced teaching methods in their programs and which technology integration strategies can be the appropriate ones based on their own environments. To improve teachers' technology integration skills, the courses that teacher education programs offer may not be enough by themselves, the course hours

and the number of courses offered by the departments can be increased along with the additional activities such as workshops, micro-teachings, panels and so on.

When thinking about these strategies altogether, it should be considered that how these strategies are implemented is just as important as knowing why they are important. This situation necessitates a qualified and different use of technology integration during teacher education. Hence, well-organized teaching methods regarding promoting technology integration by making use of the strategies that are found as effective strategies as demonstrated in the SQD model should be included in teacher education programs. Additionally, the study also revealed that if teacher education programs implement technology-friendly programs and provide new materials using the ICT strategies mentioned above, the probability of DGBL being seen as an indispensable part of teaching may be increased. Hence, as a contemporary and creative method, DGBL can be a good way of education by creating a common field of interest for digital natives and teachers of them.

## 5.3. Recommendations for Further Research

First of all, the present study is restricted to the Ankara district in Turkey and only one academic semester, more comprehensive research can be more useful to see the changes in pre-service teachers in time. If students are tested in their first years of the teacher education program, and in the last year of education, their differences in perceptions can be evaluated after they some courses including ICT integration strategies. Moreover, the number of participants can be increased and the relationship between the pre-service teachers' perceptions of ICT strategies and DGBL can be investigated with a larger sample from different districts. Taking the differences among the departments o teacher candidates can be another important point to make research since their current status and requirements can be different and by doing research the results can help to improve teacher education programs depending on the needs of the students.

Moreover, this correlational study used only self-report measures to investigate the relationship between perceptions of ICT strategies and DGBL. On the other hand, it would be better to include qualitative measurements to have a deeper understanding

of their perception along with other instruments. Furthermore, this study mainly aimed attention at the inner circle of the SQD level which was strategies at the micro level. Other strategies at the institutional level as a part of the SQD model can also be investigated in the future including access to resources, training staff, the correlation between institutions, and technology planning and leadership to prepare pre-service teachers for technology use in the future (Tondeur et al., 2012).

Finally, investigating teacher educators' perceptions of ICT could be another point of interest since they are one of the most important stakeholders to include technology in the classrooms. Their point of view, strategies they use, difficulties they face, and the methods they use to promote technology integration can be examined to see the perceptions of teacher educators, and in this way improvement in technology integration into educational contexts can be enhanced.

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# APPENDICES

## A. APPROVAL OF THE METU HUMAN SUBJECTS ETHICS COMMITTEE

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

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Sayı: 28620816/ 01 ARALIK 2021

Konu : Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi : İnsan Araştırmaları Etik Kurulu Başvurusu

**Sayın Nur AKKUŞ ÇAKIR**

Danışmanlığını yürüttüğünüz Nezaket GÜNDOĞDU'nun "Öğretmen Adaylarının Bilgi ve İletişim Teknolojileri Stratejilerini Kullanma ve Dijital Oyun Destekli Öğrenme Algıları Arasındaki İlişki" başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülmüş ve **476-ODTU-2021** protokol numarası ile onaylanmıştır.

Saygılarımızla bilgilerinize sunarız.

Prof.Dr. Mine MISIRLISOY
İAEK Başkanı

## B. Sample Items from the Scale in Turkish

**Değerli katılımcılar,**

Bu anket, siz öğretmen adaylarının dijital oyun destekli öğrenmeye yönelik algılarınızı ve öğretmen yetiştirme programlarının sizlere bilgi ve iletişim teknolojileri kullanımının gelişimi için sağladığı eğitime ilişkin düşüncelerinizi öğrenmek amacıyla tasarlanmıştır. Lütfen tüm soruları dikkatle okuyup cevap veriniz. Verilen soruların herhangi bir doğru ya da yanlış cevabı yoktur. Dolayısıyla soruları içtenlikle cevaplamanız çalışmanın anlamlı ve nitelikli olabilmesi için büyük önem taşımaktadır. Çalışma kapsamında bilgileriniz gizli tutulacak ve sadece araştırmacı tarafından değerlendirilecektir. İstediğiniz zaman çalışmayı bırakma hakkına sahipsiniz. Katkılarınız için çok teşekkürler.

*Nezaket Sema Gündoğdu*
ODTÜ Eğitim Bilimleri Yüksek Lisans Öğrencisi
e208757@metu.edu.tr

**Bölüm I**

**1.** Cinsiyetiniz:

**2.** Doğum Yılınız:

**3.** Okuduğunuz bölüm:

**4.** Sınıfınız:

**Bölüm II**

Anketin bu bölümünde sizin geçmişteki ve günümüzdeki oyun oynama deneyimlerinizle ilgili sorulara yer verilmiştir. Aşağıdaki sorularda, size en uygun olan seçeneği veya seçenekleri işaretleyiniz.

**5.** Ne sıklıkla dijital oyunlar oynuyorsunuz (video oyunları, bilgisayar oyunları, mobil oyunlar… vb.)?

☐ Her gün
☐ Haftada en az bir kez
☐ İki haftada en az bir kez
☐ Ayda en az bir kez
☐ İki aydan fazla süredir oynamıyorum
☐ Hiç oynamadım

(**Not:** Dijital oyun oynadım cevabını verenler lütfen 6. maddeyi cevaplamadan atlayınız. "Hiç oynamadım" cevabını verenler 6. maddeyi cevapladıktan sonra lütfen 20. maddeye geçiniz.)

**6.** Dijital oyunları oynamamanızın nedenleri:

☐ İlgilenmiyorum ☐ Zamanım yok ☐ Sınırlı harçlık

☐ İzin verilmiyor ☐ Diğer _____

**7.** Sıklıkla oynadığınız dijital oyun platformu türleri (birden fazla seçeneği işaretleyebilirsiniz):

☐ Video oyunları (ör: Wii, PS, XBOX) ☐ Taşınabilir oyunlar (ör: PSP, NDSL, Gameboy)

☐ Bilgisayar oyunları (bağımsız) ☐ Çevrimiçi oyunlar (internet)

☐ Mobil oyunlar ☐ Diğer _____

**8.** Dijital oyunları ilk oynadığınızda…

☐ Anaokulundaydınız ☐ İlkokuldaydınız ☐ Ortaokuldaydınız

☐ Lisedeydiniz ☐ Üniversitedeydiniz

**9.** Sıklıkla oynadığınız dijital oyun türleri (birden fazla seçeneği işaretleyebilirsiniz):

☐ Rol Yapma Oyunları ☐ Macera Oyunları ☐ Sosyal Oyunlar

☐ Nişan Oyunları ☐ Simülasyon Oyunları ☐ Strateji Oyunları

☐ Spor Oyunları ☐ Yapboz Oyunları ☐ Diğer _____

**10.** Sıklıkla oynadığınız dijital oyunların isimleri (Bir veya daha fazla isim yazabilirsiniz):

_____

**11.** Dijital oyunlar oynamak için sık sık bulunduğunuz yerler:

☐ Evde ☐ Arkadaşların evlerinde ☐ Yurtta

☐ Laboratuvarda ☐ Ofiste ☐ İnternet kafede

☐ Hareket halindeyken (ör: işe giderken) ☐ Diğer _____

**12.** Dijital oyunları hâlâ oynuyor musunuz?

☐ Evet ☐ Hayır

(**Not**: Dijital oyun oynamaya hâlâ devam edenler lütfen 13. maddeyi cevaplayınız. Dijital oyun oynamayı bırakanlar lütfen 13. maddeyi cevaplamadan atlayıp 14. ve 15. maddeleri cevaplayınız.)

**13.** Sık sık dijital oyunlar oynamanızın nedenleri (birden fazla seçeneği işaretleyebilirsiniz):

☐ Eğlence için ☐ Sosyal nedenlerle

☐ Para kazanmak için ☐ Zaman öldürmek için

☐ Gerçek dünyadan uzaklaşmak için ☐ Diğer _____

**14.** Dijital oyun oynamayı ne zaman bıraktınız?

☐ Anaokulunda ☐ İlkokulda ☐ Ortaokulda

☐ Lisede ☐ Üniversitede

**15.** Dijital oyun oynamayı bırakmanızın nedenleri:

☐ İlgi eksikliği ☐ Zaman eksikliği ☐ Para eksikliği

☐ İzin verilmemesi ☐ Diğer _____

(**Not:** Dijital oyun oynamaya hâlâ devam edenler lütfen mevcut durumunuza göre soruları cevaplayınız. Dijital oyun oynamayı bırakmış olanlar lütfen daha önceki tecrübelerinize göre soruları cevaplayınız.)

**16.** Bir hafta boyunca, genellikle hangi günlerde dijital oyunlar oynarsınız (birden fazla seçeneği işaretleyebilirsiniz)?

☐ Pazartesi ☐ Salı ☐ Çarşamba ☐ Perşembe

☐ Cuma ☐ Cumartesi ☐ Pazar

**17.** Haftada kaç saatinizi dijital oyunlara harcıyorsunuz?

☐ 0-5 saat ☐ 6-10 saat ☐ 11-15 saat

☐ 16-20 saat ☐ 20 saatten fazla

**18.** Bir gün boyunca, genellikle hangi zaman aralığında dijital oyunlar oynarsınız (birden fazla seçeneği işaretleyebilirsiniz)?

☐ 08.00-10.00 ☐ 10.00-12.00 ☐ 12.00-14.00 ☐ 14.00-16.00

☐ 16.00-18.00 ☐ 18.00-20.00 ☐ 20.00-22.00 ☐ 22.00- 00.00

☐ 00.00-02.00 ☐ 02.00-04.00 ☐ 04.00-06.00 ☐ 06.00-08.00

**Bölüm III**

Anketin bu kısmında dijital oyunlara yönelik tutumunuzla ilgili 5 farklı ifadeye yer verilmiştir. Verilen ifadeleri göz önüne alarak size en uygun olan seçeneği işaretleyiniz.

| | Kesinlikle Katılıyorum | Katılıyorum | Katılmıyorum | Kesinlikle Katılmıyorum |
|---|---|---|---|---|
| 19. Dijital oyun oynamanın oyuncuları duruma katılmaya motive edebileceğine inanıyorum. | | | | |
| 20. Dijital oyun oynamanın arkadaşlığı geliştireceğine inanıyorum. | | | | |
| 21. Dijital oyun oynamanın zaman düzenimi bozmayacağına inanıyorum. | | | | |
| 22. Dijital oyun oynamanın akademik performansımı etkilemeyeceğine inanıyorum. | | | | |
| 23. Dijital oyun oynamanın insanlara büyük keyif vereceğine inanıyorum. | | | | |

**Bölüm IV**

Anketin bu kısmında dijital oyunlar oynarken, oyunu başarılı bir şekilde oynama yeteneklerinize olan güveniniz ile ilgili 5 farklı ifadeye yer verilmiştir. Size en uygun olan seçeneği işaretleyiniz.

(**Not**: Hiç oyun oynamamış olanlar lütfen 24 ile 28 arasındaki maddeleri cevaplamadan atlayınız. Cevaplamaya 29. maddeden devam ediniz.)

| | Kesinlikle Katılıyorum | Katılıyorum | Katılmıyorum | Kesinlikle Katılmıyorum |
|---|---|---|---|---|
| 24. Oyun oynarken zorluklarla karşılaştığımda, zorlukların üstesinden gelmek için daha da çok çalışacağım | | | | |
| 25. Oyunda kendim için belirlediğim hedeflerin çoğuna ulaşabileceğime güveniyorum. | | | | |
| 26. Dijital oyunlardaki zorluklarla yüzleşmek için kendime güvenim var. | | | | |
| 27. Diğer oyunculara kıyasla birçok dijital oyunda daha iyi performans gösterdiğime inanıyorum. | | | | |
| 28. Zor oyunlarla karşılaşsam bile, oyun hedeflerine ulaşmak için zorlukların üstesinden gelebileceğime inanıyorum | | | | |

**Bölüm V**

"Eğitici dijital oyunlar", eğitim amaçlı tasarlanmış ve bilgisayar, televizyon veya mobil cihazlarda oynanabilen dijital oyunları kapsar. Bu bölümde, eğitici dijital oyunların etkililiğine yönelik düşüncelerinizi araştıran ifadelere yer verilmektedir. Size en uygun olan seçeneği işaretleyiniz.

**29.** Hiç eğitici dijital oyunlar oynadınız mı? ☐ Evet ☐ Hayır

| | Kesinlikle Katılıyorum | Katılıyorum | Katılmıyorum | Kesinlikle Katılmıyorum |
|---|---|---|---|---|
| 30. Eğitici dijital oyunların öğretmenlerin öğretimini kolaylaştırabileceğini düşünüyorum. | | | | |
| 31. Eğitici dijital oyunların öğrencilerin öğrenme motivasyonunu artırabileceğini düşünüyorum. | | | | |
| 32. Öğreteceğim konu ile ilgili eğitici dijital oyunlar kullanabileceğimi düşünüyorum. | | | | |
| 33. Eğitici dijital oyunların öğrencilerin daha iyi notlar almasına yardımcı olabileceğini düşünüyorum. | | | | |
| 34. Eğitici dijital oyunların öğrencilerin problem çözme becerilerini geliştirebileceğini düşünüyorum. | | | | |
| 35. Eğitici dijital oyunların öğrencilerin bilgi arama alışkanlığını geliştirmelerine yardımcı olabileceğini düşünüyorum. | | | | |
| 36. Eğitici dijital oyunların öğrencilerin iletişim becerilerini geliştirmelerine yardımcı olabileceğini düşünüyorum. | | | | |
| 37. Eğitici dijital oyunların öğrencilerin iş birliği yapmayı öğrenmelerine yardımcı olabileceğini düşünüyorum. | | | | |
| 38. Eğitici dijital oyunların öğrencilerin düşünme yeteneğini geliştirebileceğini düşünüyorum. | | | | |
| 39. Eğitici dijital oyunların öğrencilerin hayal güçlerini geliştirmelerine yardımcı olabileceğini düşünüyorum. | | | | |
| 40. Eğitici dijital oyunların sınıfta uygulanabileceğini düşünüyorum. | | | | |
| 41. Eğitici dijital oyunların öğrenme konuları ile bütünleştirilebileceğini düşünüyorum. | | | | |
| 42. Okulların eğitsel dijital oyunların uygulanmasını desteklemek için yeterli teknoloji olanaklarına sahip olduğunu düşünüyorum. | | | | |
| 43. Ebeveynlerin eğitici dijital oyunların uygulanmasını kabul edeceğini düşünüyorum. | | | | |
| 44. Öğretmenlerin eğitici dijital oyunların uygulanmasını kabul edeceğini düşünüyorum. | | | | |
| 45. Eğitici dijital oyunların uygulanmasının bağımsız modu kullanması gerektiğini düşünüyorum. | | | | |
| 46. Eğitici dijital oyunların uygulanmasının çevrimiçi modu kullanması gerektiğini düşünüyorum. | | | | |

**47.** Gelecekte eğitici dijital oyunları kullanmak ister misiniz? ☐Evet ☐Hayır

**48.** Gelecekte, eğitici dijital oyun tasarımı etkinliklerine dahil olmak ister misiniz? ☐Evet ☐Hayır

**Bölüm VI**

Bilgi ve İletişim Teknolojileri (BİT); bilgisayar, İnternet, veri tabanları, tablet, akıllı telefon, Office programları, web 2.0 araçları, e-posta gibi bilgiye erişme ve iletişim kurma amaçlı olarak kullandığımız cihaz ve teknolojileri kapsamaktadır. Verilen ifadeleri göz önüne alarak size en uygun olan seçeneği işaretleyiniz.

| **Lisans eğitimim süresince;** | **Tamamen Katılıyorum** | **Katılıyorum** | **Kısmen Katılıyorum** | **Kısmen Katılmıyorum** | **Katılmıyorum** | **Tamamen Katılmıyorum** |
|---|---|---|---|---|---|---|
| **1.** Bilgi ve iletişim teknolojilerinin eğitim ortamında kullanımına yönelik pek çok örnek gördüm. | | | | | | |
| **2.** Bilgi ve iletişim teknolojilerini gelecekte eğitim uygulamalarına entegre edebilmek için yeteri kadar gözlemledim. | | | | | | |
| **3.** Bilgi ve iletişim teknolojileri uygulamalarının sınıfımda kullanmama ilham veren iyi örneklerini gördüm. | | | | | | |
| **4.** Eğitimde bilgi ve iletişim teknolojilerinin kullanılma potansiyeli somut bir şekilde gösterildi. | | | | | | |
| **5.** Bilgi ve iletişim teknolojilerinin eğitimdeki rolünü yansıtma olanağı sağlandı. | | | | | | |
| **6.** Bilgi ve iletişim teknolojilerini eğitime entegre etmenin zorluklarını tartıştık. | | | | | | |
| **7.** Bilgi ve iletişim teknolojilerinin sınıf ortamında kullanımına yönelik deneyimlerimizi tartışma fırsatı verildi (örneğin, staj sırasında). | | | | | | |
| **8.** Eğitimde bilgi ve iletişim teknolojilerine yönelik genel tutumumuzu tartıştığımız belirli zamanlar oldu. | | | | | | |
| **9.** Bilgi ve iletişim teknolojilerinin entegre edildiği ders tasarlama konusunda yeterli destek aldım. | | | | | | |
| **10.** Bilgi ve iletişim teknolojilerini derslere nasıl entegre edebileceğimizi en ince ayrıntısına kadar öğrendik. | | | | | | |
| **11.**Eğitim materyalleri geliştirirken bilgi ve iletişim teknolojilerinin kullanımına yönelik yardım aldık. | | | | | | |
| **12.**Staj dönemimde kullanmak üzere bilgi ve iletişim teknolojileri ile zenginleştirilmiş dersler ve projeler geliştirmek için epey yardım aldım. | | | | | | |
| **13.**Diğer öğretmen adaylarıyla eğitimde bilgi ve iletişim teknolojilerinin kullanılmasına yönelik çalışabilmem için yeterli zamanlar oldu (örneğin; Birlikte bilgi ve iletişim teknolojileri temelli dersler geliştirdik) | | | | | | |
| **14.**Eğitimde bilgi ve iletişim teknolojilerinin kullanımına ilişkin iş birliğinin önemine ikna oldum. | | | | | | |
| **15.**Eğitim bağlamında bilgi ve iletişim teknolojilerinin kullanımı konusunda öğretmen adayları birbirlerine yardımcı oldu. | | | | | | |
| **16.**Eğitimde bilgi ve iletişim teknolojilerinin kullanımına dair deneyimler paylaşıldı. | | | | | | |
| **17.**Sınıfta bilgi ve iletişim teknolojilerinin farklı kullanımlarını test etmem için yeterli zamanlar oldu. | | | | | | |
| **18.**Staj dönemim boyunca bilgi ve iletişim teknolojilerinin sınıfta kullanımını öğrenebildim. | | | | | | |

| Lisans eğitimim süresince; | Tamamen Katılıyorum | Katılıyorum | Kısmen Katılıyorum | Kısmen Katılmıyorum | Katılmıyorum | Tamamen Katılıyorum |
|---|---|---|---|---|---|---|
| **19.**Bilgi ve iletişim teknolojilerinin sınıf ortamında kullanımında deneyim kazanmak için teşvik edildim. | | | | | | |
| **20.**Öğretmen adayları olarak eğitim ortamında bilgi ve iletişim teknolojilerini kullanmak için girişimde bulunduğumuzda teşvik edildik. | | | | | | |
| **21.**Derslerimde bilgi ve iletişim teknolojilerinin kullanımı hakkında yeterli geribildirimi aldım. | | | | | | |
| **22.**Bilgi ve iletişim teknolojileri yeterliklerim ayrıntılı bir şekilde değerlendirildi. | | | | | | |
| **23.**Bilgi ve iletişim teknolojileri yeterliklerimi nasıl daha fazla geliştirebileceğim konusunda yeterli geribildirim aldım. | | | | | | |
| **24.**Sınıfta bilgi ve iletişim teknolojilerinin kullanımı yeterliklerim düzenli olarak değerlendirildi. | | | | | | |

ÇALIŞMAMIZA KATILDIĞINIZ İÇİN TEKRAR TEŞEKKÜR EDERİZ.

## C. TURKISH SUMMARY / TÜRKÇE ÖZET

# ÖĞRETMEN ADAYLARININ ÖĞRETMEN EĞİTİMİNDE KULLANILAN BİLGİ VE İLETİŞİM TEKNOLOJİLERİ ENTEGRASYONUNA YÖNELİK ALGILARI İLE DİJİTAL OYUN TEMELLİ ÖĞRENMEYE İLİŞKİN ALGILARI ARASINDAKİ İLİŞKİ

## Giriş

### Araştırmanın amacı ve önemi

Bu çalışmanın amacı, öğretmen adaylarının bilgi ve iletişim teknolojileri entegrasyonunu kolaylaştırmak için öğretmen eğitiminde kullanılan stratejilere ilişkin algıları ile dijital oyun temelli öğrenmeye ilişkin algıları arasındaki ilişkiyi (1) teknoloji entegrasyonunu kolaylaştırmak için öğretmen eğitiminde kullanılan bilgi ve iletişim teknolojileri stratejilerine yönelik algılar, (2) dijital oyun deneyimi, (3) dijital oyuna yönelik tutumlar, (4) dijital oyun öz-yeterliği, (5) dijital oyun temelli öğrenme algıları olarak tanımlanan çeşitli değişkenler açısından incelemektir.

Günümüzde teknoloji, toplumun her kesiminden çeşitli şekillerde ve çok farklı amaçlarla kullanılmaktadır (Younes ve Al-Zoubi, 2015). Bu nedenle teknoloji ve dijital oyunlar çocukların günlük yaşamlarının bir parçası olarak yadsınamaz derecede önemli bir yer edinmiştir (Danby vd., 2018; Graafland, 2018; Johnston vd., 2018; Orlando, 2021; Robinson, 2021) ve teknolojik gelişmelerin etkileri eğitim alanında da görülmeye başlanmıştır (Allcoat vd., 2021; Ghory & Ghafory, 2021; Oliveira & Souza, 2021; Raja & Nagasubramani, 2018). Öğretmenler öğrenme sürecinin kalbi olduğu

için, öğretmen adaylarını bilgi ve öğretim teknolojileri stratejilerini ve dijital oyun temelli öğrenmeyi etkin bir şekilde kullanmaya hazırlamak kaçınılmaz hale gelmiştir (Tondeur vd., 2012; Williams vd., 2009). Bu nedenle, bu çalışma, öğretmen adaylarının bilgi ve iletişim teknolojileri stratejilerini kullanma algıları ile dijital oyun temelli öğrenme arasındaki ilişkiyi incelemeyi amaçlamıştır.

Mevcut literatür incelendiğinde teknoloji ve dijital oyunların öğrenme süreçlerine entegre edilmesi konusunda öğretmen yetiştirme programlarında bir yetersizlik olduğu görülmektedir (An, 2018; Groff, 2018; Meredith, 2016). Ayrıca, öğretmen adaylarının, lisans eğitimleri boyunca aldıkları eğitimin, dijital oyunların eğitsel kaygılarla kullanımını kolaylaştırma açısından yetersiz olduğu belirtilmektedir (Denham, 2019; Takeuchi ve Vaala, 2014). Bu çalışmanın bulguları, eğitimde teknoloji entegrasyonu ve dijital oyun temeli öğrenme hakkında devam eden araştırmalara katkıda bulunmayı amaçlamaktadır. Ayrıca, dijital yerliler olarak adlandırılan yeni neslin ihtiyaçları doğrultusunda, öğretmen adaylarının öğretim sürecinin kilit noktaları olmaları nedeniyle teknoloji ve dijital oyun temelli öğrenmenin kullanımına ilişkin algılarını öğrenmek önem taşımaktadır. (Gibson ve ark. al., 2007). Öğretmen adaylarının bakış açılarını anlamak; kaynakların planlanması, altyapının sağlanması ve öğretim programının geliştirilmesi ile ilgili daha iyi ilerlemelerin gelişmesine yardımcı olabilir (Teo, 2015).

Ayrıca, öğretmen adaylarının öğretmen hazırlık programlarının bir parçası olarak sahip oldukları teknolojik deneyimlerin niceliği ve kalitesi, yeni öğretmenlerin teknolojiyi ne kadar çabuk kabul ettiğini belirlemede önemli bir belirleyicidir (Agyei ve Voogt, 2011). Dijital oyunların öğretim yöntemi olarak kullanılmasına yönelik olumlu bir tutum geliştirmek, öz-yeterlik düzeylerini yükseltmek ve olumlu bir algıya sahip olmak için öğretmen adaylarına üniversite yaşamları boyunca gerekli eğitimler verilmeli, böylece farklı oyunlara daha fazla maruz bırakılmalı, böylece çeşitli teknoloji entegrasyon stratejilerinin gelecekte kullanma olasılığını arttrılmalıdır (Göktas, Yıldırım ve Yıldırım, 2008; Tondeur ve diğerleri, 2012). Bu düşünceye paralel olarak öğretmen yetiştirme programları gelecekte faydalı olabilecek faydalı bilgi ve iletişim teknolojileri stratejileri hakkında eğitim vermelidir. Bu çalışmada, teknoloji kullanımının önemli stratejileri olarak görülen teknoloji entegrasyon

becerilerini geliştirmeye yönelik tekniklerden altı tanesi yer almaktadır. Bu stratejilerden ilki, öğretmen adaylarının çevrelerinden de herkes gibi öğrendikleri ve örnek aldıkları kişiler gibi davranma eğiliminde oldukları için uygun rol model almanın önemi ile ilgilidir. Ayrıca rol modellerinden geri bildirim almak, arkadaşlarıyla işbirliği içinde çalışmak, kendi gelişimlerini yansıtma şansına sahip olmak diğer bilgi ve iletişim stratejileri arasındadır. Ayrıca, öğretmen adaylarına kendi materyallerini veya ders planlarını sağlama fırsatı verilirse, bunları gerçek ortamlarda kullanarak deneyimler elde etmek için yeterli zamana sahip olurlarsa, etkili teknoloji kullanımına ilişkin algıları olumlu yönde değiştirilebilir (Tondeur ve diğerleri, 2016). Dolayısıyla, bu çalışma ile sınıflarda teknolojinin dahil edilmesini teşvik etmek için en etkili yöntemlerin önemi aydınlatılabilir. Dijital oyun temelli öğrenme algıları ile bilgi ve iletişim teknolojileri stratejileri arasındaki ilişkinin önemi, herhangi bir yeni teknolojik yöntemi veya öğretim aracını dahil etmenin birincil faktörü olarak görülebilir (Hébert ve diğerleri, 2021; Hayak ve Avidov- Ungar, 2020; Kaimara ve diğerleri al., 2021; Uluay ve Doğan, 2020).

Bütün bunlar bir arada ele alındığında, bu çalışma öğretmen adaylarının öğretmen yetiştirme programlarında bilgi ve iletişim teknolojileri stratejileri kullanımına ilişkin algıları ile dijital oyun temelli öğrenme arasındaki ilişkiyi inceleyerek literatüre katkı sağlamayı amaçlamıştır. Ayrıca bu çalışmada kullanılan ölçek, çalışmanın amacına uygun olarak Türkçe'ye uyarlanmıştır. Bu çalışma aynı zamanda öğretmen adaylarının dijital oyun deneyimi, dijital oyunlara yönelik tutumları, dijital oyun öz-yeterliği ve dijital oyun temelli ğrenm algıları olmak üzere dijital oyun temelli öğrenmeye yönelik algılarını etkileyen dört boyut hakkında bilgi sağlayacaktır ve teknoloji entegrasyonunu kolaylaştırmak için öğretmen eğitiminde kullanılan stratejilerin algılanmasının yanı sıra dijital oyun temelli öğrenmeye uygun ve kullanışlı bir öğretim aracı olma fırsatı verecektir. Kısaca bu çalışma, öğretmen adaylarının dijital oyun temelli öğrenmeyi nasıl gördükleri ve gelecekte bir eğitim aracı olarak kullanmayı tercih edip etmedikleri konusunda araştırma yaparak literatüre katkı sağlayacaktır. Ayrıca, bu çalışma eğitim bağlamında paydaş olan diğer araştırmacılar için iyi bir başlangıç noktası olabilir.

## Literatür Taraması

Bilgi ve iletişim teknolojileri, tüm iletişim teknolojilerinin bilgi edinme, toplama, dönüştürme, paylaşma ve ortaya çıkarma anlamına gelirken (Yusuf & Yusuf, 2009).; dijital oyun temelli öğrenme, pedagojik bir araç olarak dijital oyunların entegrasyonunu içeren bir öğretim yöntemini ifade eder (Prensky, 2001; Van Eck, 2006). Eğitim ortamlarında bilgi ve iletişim teknolojilerinin kullanımını ve dijital oyun temelli öğrenme entegrasyonunu etkileyen bazı faktörler vardır (Casillas Martín et al., 2019; Koh et al., 2012; An et al., 2016; Denham et al. 2016). Ancak öğretmenler, öğretim sürecinin kilit faktörleri ve kalbi olduklarından, diğer değişkenler arasında özel bir yere sahiptirler. Bu nedenle, eğitim araştırmalarında öğretmen özelliklerine artan ilgi ile hem bilgi ve iletişim teknolojileri hem de dijital oyun temelli öğrenmeye yönelik bakış açılarını anlamak önemlidir (Tondeur et al., 2012; Williams et al., 2009).

Mevcut çalışmadaki literatür taraması, nitel kanıtların sentezi modelinin iç çemberine bağlı olarak öğretmen yetiştirme programlarında bilgi ve iletişim teknolojileri stratejilerinin kullanımını araştıran göze çarpan değişkenlerin otantik deneyim, işbirliği, öğretim tasarımı, yansıtma, rol model ve geri bildirim olduğunu ortaya koymuştur (Tondeur et al., 2012). Ayrıca, dijital oyun temelli öğrenmeye yönelik tutum, oyun deneyimi, dijital oyun öz-yeterliği ve dijital oyun temelli öğrenme uygulanmasının önündeki potansiyel engeller de öğretmen adaylarının dijital oyun entegrasyonuna yönelik algılarını araştırmak için literatürde en sık kullanılan değişkenlerdendir (Deng et al., 2020; Hussain et al., 2017; Nikiforidou, 2018, Whitton & Rooney, 2016). Literatür göz önüne alındığında, bilgi ve iletişim teknolojileri ile ilgili çalışmalar, teknolojinin eğitim bağlamlarına entegrasyonunun her geçen gün arttığını ve öğretmenlerin bakış açılarının yeni nesil öğrencilerin ihtiyaçlarını karşılamak için olumlu yönde değiştiğini göstermektedir. Ayrıca dijital oyun temelli öğrenme ile ilgili çalışmalar, dijital oyun temelli öğrenmenin sınıflarda hala yeteri kadar yer almamasına ragmen, entegrasyonunun yine de eskiye göre arttığını göstermektedir. Bununla birlikte, dijital oyun temelli öğrenme çoğunlukla bilişsel becerileri veya üst düzey düşünme becerilerini geliştirmekten ziyade öğrencilerin derse katılımını, motivasyonunu ve ilgisini destekleyen bir öğrenme yardımcısı olarak görülmektedir (Aşık et al., 2019; Drummond & Sweeney, 2017; Hoyles, 2018;

McLeod & Carabott, 2019; Rana et al., 2019). Yukarıda bahsedilen değişkenlerle ilgili literatür genellikle çok yönlü ilişkilere işaret etmektedir. Özellikle öğretmen adaylarının bilgi ve iletişim teknolojileri ve dijital oyun temelli öğrenme algıları arasındaki ilişki, özellikle oyun deneyimi ve öğretmen adaylarının tutumları açısından değişime neden olmuştur (An & Cao, 2016; Baturay et al., 2017; Blackwell et al., 2016; Voulgari et al., 2020). Başka bir deyişle, olumlu deneyimler ve tutumlar yapı ile olumlu yönde ilişkiliyken, olumsuz deneyimler yapı ile olumsuz ilişkilidir. Tüm değişkenler bir arada ele alındığında, bu çalışma, öğretmen adaylarının bilgi ve iletişim teknolojileri entegrasyonunu kolaylaştırmak için öğretmen eğitiminde kullanılan stratejilere ilişkin algıları ile Türk eğitim bağlamında dijita oyun temelli öğrenme arasındaki ilişkiyi araştırmayı amaçlamaktadır.

## Yöntem

### Desen

Bu araştırma tasarımı korelasyon çalışması olarak tasarlanmıştır ve iki veya daha fazla ölçülebilir değişken arasındaki ilişkileri manipüle etmeden araştırmayı amaçlamıştır (Fraenkel ve diğerleri, 2015).

### Örneklem

Araştırmanın hedef evrenini Ankara ilindeki eğitim fakültelerinde öğrenim gören üçüncü ve dördüncü sınıf üniversite öğrencileri oluşturmuştur. Zaman kısıtlaması nedeniyle Ankara'nın çeşitli ilçelerindeki tüm üniversitelere erişim zor olmuştur. Toplamda, 306 öğretmen adayından veri toplanmıştır ve yaşları 21 40 arasında değişmektedir.201 kadın katılımcı varken, 105 erkek katılımcı vardır. Ayrıca katılımcılar daha deneyimli oldukları ve öğretmen yetiştirme programında kullanılan bilgi ve iletişim teknolojileri entegrasyon stratejilerini daha fazla görme şansına sahip oldukları için 3. sınıf ve 4. sınıf öğrencilerden seçilmiştir. Katılımcılar yedi farklı eğitim fakültesi bölümünde öğrencilerdir: yabancı dil öğretmenliği, okul öncesi öğretmenliği, bilgisayar eğitimi ve öğretim teknolojisi öğretmenliği, kimya öğretmenliği, fizik öğretmenliği, matematik öğretmenliği ve ilköğretim fen bilgisi öğretmenliği.

## Veri Toplama Araçları

Mevcut çalışmada veri toplamak için iki farklı araç kullanılmıştır. Bunlar, Nitel Kanıt Sentezi Ölçeği ve Dijital Oyun Destekli Öğrenme Ölçeğidir. Ayrıca katılımcılara ilişkin demografik bilgiler (cinsiyet, doğum yılı, sınıf düzeyi ve bölüm) toplanmıştır.

Nitel Kanıt Sentezi Ölçeği, Nitel Kanıt Sentezi modelinin iç çemberine bağlı olarak Tondeur ve diğerleri tarafından (2016) geliştirilmiştir. Bu model, öğretmen adaylarını mesleklerinin bir parçası olarak gelecekte etkili teknoloji entegrasyonuna hazırlamak için faydalı stratejiler içermektedir (Tondeur vd., 2012). Nitel Kanıt Sentezi modeli hem mikro hem de kurumsal düzeyde stratejilerden oluşurken, Nitel Kanıt Sentezi ölçeği rol model, yansıtma, öğretim tasarımı, işbirliği, otantik deneyim ve geri bildirim gibi mikro düzeyde stratejiler olan altı boyutu içerir. Ayrıca, ölçek bir öz bildirim aracıdır ve altılı Likert tipi bir ölçeğe sahiptir. Cevap seçenekleri "kesinlikle katılmıyorum" ile "tamamen katılıyorum" arasında değişmektedir. Ölçek 24 maddeden oluşmaktadır ve Baran ve arkadaşları tarafından Türkçe'ye uyarlanmıştır. (2019). Ölçeğin Türkçe versiyonun yapı geçerliliğini kontrol etmek ve Tondeur ve diğerleri tarafından detaylandırılan Nitel Kanıt Sentezi modelini doğrulamak için Doğrulayıcı Faktör Analizi yapılmıştır. (2016). Ayrıca, uyum indeksleri, veriler ve model yapısı arasında iyi bir uyum olduğunu göstermiştir. Ölçeğin genelinin güvenirliğini değerlendirmek için Cronbach alfa kontrol edilmiş ve katsayısı 97 bulunmuştur.

Dijital Oyun Destekli Öğrenme ölçeği, Hsu ve Chiou (2019) tarafından öğretmen adaylarının dijital oyun temelli öğrenmeye yönelik algılarını araştırmak amacıyla geliştirilmiş ve araştırmacı tarafından bu çalışma için Türkçeye uyarlanmıştır. Ölçek dört boyut ve kırk dokuz sorudan oluşan çok boyutlu bir öz bildirim aracıdır. Ölçekte yer alan dört boyut sırasıyla; dijital oyun deneyimleri, dijital oyuna yönelik tutumlar, dijital oyun öz-yeterliği ve dijital oyun temelli öğrenme algısıdır. Demografik bilgiler ve dijital oyun deneyimleriyle ilgili sorular ya açık uçlu ya da çoktan seçmeli sorulardır. Ölçeğin kalan kısmındaki sorular dörtlü Likert tipi bir ölçeğe sahiptir. Bu çalışmada, öğretmen adaylarının dijital oyun temelli öğrenme ile ilgili algılarını

araştırmak için Dijital Oyun Destekli Öğrenme algı anketinin Türkçe versiyonunun 44 maddesi kullanılmıştır.

Dijital Oyun Destekli Öğrenme ölçeği, geçerlilik ve güvenirlik kanıtı sağlamak için pilot teste tabi tutulmuş ve ölçekteki faktörlerin yapılarını bulmak için SPSS 26.0 ile Açımlayıcı Faktör Analizi yapılmıştır. Sonuçlar, verilerdeki varyansın %63,5'inin ölçeğin özdeğerleri birden büyük olan üç faktörlü yapısıyla açıklandığını göstermiştir. Maddelerin faktör yükleri faktör yükleri .60 ile .88 arasında değişmektedir. Ek olarak, Cronbach's alpha ile tahmin edilen iç tutarlılık .94'tür.

**Veri Toplama Süreci**

Veri toplama sürecinin ilk adımı olarak çalışmanın herhangi bir yönden kimseye zarar vermediğinin kanıtlanması için ODTÜ İnsan Denekleri Etik Kurulu'ndan gerekli izinler alınmıştır. İzinlerin alınmasının hemen ardından Ankara'daki üniversitelerin farklı eğitim fakültelerinde öğrenim gören 286 öğretmen adayı ile pilot çalışma yapılmıştır. Bu nedenle araştırma tarafından bu çalışmanın amacına yönelik olarak Türkçe'ye çevrilen Dijital Oyun Destekli Algı anketi pilot çalışmaya dahil edilmiştir.

Her bir katılımcının ölçeklerdeki soruları yanıtlaması yaklaşık 15 dakika sürmüştür. Araştırmacı ölçekleri uygulamak için sınıfa gittiğinde tüm katılımcılara araştırma hakkında detaylı bilgi verilmiştir. Katılımcılara ayrıca araştırmaya gönüllü olarak katılmalarının istendiği ve istedikleri zaman çalışmayı bırakabilecekleri ya da soruları cevaplamaktan rahatsız olabilecekleri konusunda bilgi verildi. Ayrıca katılımcılara tamamen anonim olacakları ve kendilerinden toplanan verilerin gizli tutulacağı ve araştırmacı dışında hiç kimsenin verilere erişmesine izin verilmeyeceği belirtilmiştir. Daha sonra katılımcılardan ölçekteki soruları dikkatli ve içten bir şekilde cevaplamaları istenmiştir. Araştırmacı ayrıca, her bir katılımcı soruları yanıtlamayı bitirinceye kadar netleştirilmesi gereken veya aklına takılan yerler olursa diye sınıfta bekledi.

**Veri Analizi**

Araştırma sorularına cevap verebilmek için IBM SPSS 26 kullanılarak hem betimsel hem de çıkarımsal istatistikler açısından veri analizi yapılmıştır. İstatistiksel analizler yapılmadan önce, psikometrik özellikleri kontrol etmek için Açımlayıcı Faktör Analizi sonuçları ve Cronbach alfa katsayıları dikkate alınmıştır.

Doğrusal regresyon analizi, bir ölçüt değişkeni ile bir yordayıcı değişken arasındaki korelasyonu değerlendirmek için kullanılan bir yöntemdir (Fraenkel ve diğerleri, 2015). Buna göre, 1 yordayıcı değişkenli bu ilişkisel araştırma çalışması için veri analizi için en iyi seçenek basit doğrusal regresyon analizi olarak görülmüştür. Ayrıca analiz yapılmadan önce lineer regresyon analizinin varsayımları (normallik, çoklu doğrusallık, homoskedastisite, doğrusallık ve bağımsız hatalar) kontrol edilmiştir. Daha sonra, bu çalışmanın amacı için gerekli tanımlayıcı ve çıkarımsal istatistikler gerçekleştirilmiştir. Örneklemin ortalama puanları ve standart sapmaları ile frekans değerleri değerlendirilerek, katılımcılar arasında hem cinsiyet hem de yaş açısından benzerlik ve farklılıkları belirlemek için tanımlayıcı istatistikler analiz edilmiştir.

**Araştırmanın Sınırlılıkları**

Mevcut çalışmanın dikkate alınması gereken bazı sınırlamaları vardır. Her şeyden önce, katılımcıların algılarını incelemek amacıyla veri toplamak için öz bildirim ölçümleri kullanıldığından, katılımcıların daha sosyal olarak onaylanmış cevaplar vermesi gibi birkaç endişe nedeniyle katılımcıların kendi gerçek duygularını gizleme olasılığı vardır.

Ardından, çalışma ilişkisel bir çalışma olduğundan ve öğretmen adaylarının bilgi ve iletişim teknolojileri stratejilerini kullanma algıları ile dijital oyun temelli öğrenme arasındaki ilişkiyi araştırdığından, herhangi bir neden-sonuç çıkarımı yapılmamıştır. Yani değişkenler arasındaki ilişki, mevcut çalışmada yer almayan dışsal değişkenlerden etkilenebilir.

Son olarak, araştırmanın örneklemi, zaman kısıtlamaları ve yoğun programlarından dolayı öğretmen yetiştiricilerinden izin almayla ilgili yaşanan problemlerden dolayı, örneklem Ankara'daki köklü bir devlet üniversitede öğrenim görmekte olan 3. ve 4.

sınıf öğretmen adaylarına indirgenmiştir. Bu durum dış geçerlilikle ilgili soruna yol açabilir. Bu nedenle, bu çalışmanın bulguları diğer eğitim bağlamlarına genellenemez.

## Bulgular

Dijital Oyun Destekli Öğrenme Ölçeği için geçerlik kanıtı sağlamak için maksimum olabilirlik analizi kullanılarak ölçekteki 26 madde üzerinden doğrulayıcı faktör analizi yapılmıştır ve ölçeğin üç faktörlü yapısı doğrulanmıştır.

Nitel Kanıt Sentezi Ölçeği için geçerlik kanıtı sağlamak amacıyla, Nitel Kanıt Sentezi Ölçeğinin altı faktörlü yapısını incelemek için maksimum olabilirlik analizi kullanılarak ölçekteki 24 madde üzerinden doğrulayıcı faktör analizi yapılmıştır. Nitel Kanıt Sentezi Ölçeği'nin 24 maddelik altı faktörlü modeli, önerilen modele tam olarak uymadığı sonucuna varılmıştır. Bu nedenle, model Tondeur ve diğerleri (2016) ve Baran ve ark. (2017) tarafından tanımlandığı gibi tek faktörlü bir modele indirgenmiştir. Varyansın %62.26'sı bu tek faktörlü yapı ile açıklanmıştır. Tek faktörlü modelin faktör yüklerinin .64 ile .90 arasında değişen değerlerle anlamlı olduğu görülmüştür.

Öğretmen adaylarının dijital oyun deneyimleri ve öğretmen yetiştirme programlarında kullanılan bilgi ve iletişim stratejilerine ilişkin algılarına ilişkin profillerini incelemek için tanımlayıcı istatistikler kullanılmıştır. Tanımlayıcı istatistiklerden elde edilen sonuçlar, hayatında en az bir kez dijital oyun oynayan öğretmen adaylarının sayısının hiç oynamayanlara göre yüksek düzeyde olduğuna ışık tutmaktadır. Ayrıca, katılımcıların üçte ikisinden fazlası ayda en az bir kez dijital oyun oynamaya devam etmektedir. Ek olarak, tanımlayıcı istatistik sonuçlarından katılımcıların en çok mobil oyunları oynamayı sevdikleri ve bunu hem çevrimiçi hem de çevrimdışı bilgisayar oyunlarının izlediği görülmüştür. Katılımcıların yaklaşık yarısı bir haftada en fazla 10 saat dijital oyun oynadıklarını ve bu oyun süresinin daha çok hafta sonları olduğunu ifade etmiştir. Neden dijital oyun oynadıkları veya oynamadıkları sorulduğunda, katılımcıların dijital oyunları oynamayı tercih etmemelerinin temel nedeni ilgi eksikliği olduğu, diğer yandan dijital oyun oynama nedenlerinin de eğlence ve sosyal sebepler olduğu belirtildi. Ayrıca katılımcıların eğitsel dijital oyunlar deneyim sayısı yüksek düzeydedir. Eğitsel oyun oynama şansına sahip olsalar ya da olmasalar da

hemen hemen her katılımcı derslerine eğitsel dijital oyunları dahil etmeye istekli olduklarını ancak eğitsel dijital oyunların tasarımının bir parçası olma kısmında endişeleri olduğunu belirtmişlerdir.

Ayrıca teknoloji entegrasyonunu geliştirmek için öğretmen yetiştirme programlarında yer alması gereken altı bilgi ve iletişim teknolojileri stratejileri olan Nitel Kanıt Sentezi ölçeğinin boyutlarına ilişkin betimsel sonuçların bulguları, bu çalışmada öğretmen adaylarının en çok deneyimledikleri stratejinin yansıtma olduğu görülmüştür. Katılımcılar ayrıca diğer öğrencilerle işbirliği yapma şansına sahipken ve teknoloji entegrasyonu ile ilgili deneyimler yaşama şansı bulmuşken, geri bildirim stratejisi için verdikleri cevapların puanları diğerlerine göre daha düşüktü. Ancak en düşük puanlar öğretim tasarımı stratejilerine aitti. En düşük pauan ise katılımcıların ders planlarını tasarlarken bilgi ve iletişim teknolojilerini derslerine nasıl entegre edeceklerini ayrıntılı olarak öğrendiklerini belirten 10. maddeydi.

Regresyon analizlerinin sonuçları, öğretmen eğitimi programlarında kullanılan bilgi ve iletişim teknolojileri stratejilerinin, Dijital oyun temelli öğrenmeye yönelik tutum, öz-yeterlik ve algının güçlü yordayıcıları olduğunu ortaya koymuştur. Sonuç olarak, katılımcıların bilgi ve iletişim teknolojileri algısının değişkenliğin sırasıyla %14'ü, %14'ü ve %25'i olan tutum, öz-yeterlik ve algı bağımlı değişkenlerini yordadığı bulunmuştur. Eğitimleri boyunca rol modelleri olan öğretmen adaylarına kendi BİT kullanımları hakkında yansıtma şansı verildiği, teknoloji kullanımını içeren materyaller tasarlamaya çalıştıkları, takım halinde çalışma şansı buldukları ve birbirlerine yardım ettikleri sonuçlardan çıkarılabilir. , sadece teorik bilgilerden ziyade teknolojinin gerçek kullanımını deneyimlemek için zamana sahip olan ve tüm süreç için geri bildirim alan, olumlu tutumlar, yüksek düzeyde öz yeterlilikler ve olumlu algılar ile gelecekte derslerine dijital oyun temelli öğrenmeyi dahil etmeyi düşünme olasılıkları daha yüksekti. Eğitimleri boyunce rol modelleri olan öğretmen adayları, kendi bilgi ve iletişim teknolojileri kullanımı gelişmelerine yorumda bulunma şansı olanlar, teknoji kullanımıı gerektiren materyaller dizayn etmeyi deneyenler, takım olarak çalışma ve birbirine yardım etme şansı olanlar, sadece teorik olarak bilgi sahibi olmaktansa teknoloji entegrasyonu bilgilerini gerçek hayatta kullananlar, ve tüm bu süreçte düzenli olarak geri bildirim alanların ileride derslerine dijital oyun temelli

öğrenmeyi dahil etmeyi düşünme ihtimalleri artmıştır. Dolayısıyla, ilişkinin yönüne ve boyutuna bağlı olarak, eğitimde kullanılan bilgi ve iletişim stratejilerine ilişkin algıların, öğretmen adaylarının djiital oyun temelli öğrenme kullanma algıları üzerinde olumlu ve anlamlı bir etkiye sahip olduğu sonucuna varılabilir.

## Sonuç ve Öneriler

Sonuç olarak, bu çalışma, öğretmen adaylarının bilgi ve iletişim teknolojileri stratejilerinin kullanımına yönelik algılarının, dijital oyun temelli öğrenmeye yönelik algılarını, tutumlarını ve dijital oyun öz-yeterliklerini belirlemede önemli bir rol oynadığını doğrulamıştır. Bu çalışma aynı zamanda öğretmen yetiştirme programlarında öğretmen adaylarını teknolojiyi kullanmaya hazırlamak için yansıtma ve rol modellerin en çok kullanılan stratejiler olduğunu ortaya koymuştur. Ekip çalışmalarına dahil olmalarını sağlamak, birbirlerine yardım edecekleri ortamlar yaratmak ve bilgi ve iletişim teknolojileri kullanımı için işbirliği gerektiren diğer etkinlikler ve öğretmen adaylarının derslerinde edindikleri bilgilerden yararlanarak bilgi ve iletişim teknolojilieri kullanımının çeşitli yollarını test etmelerini sağlayan özgün deneyimler yaşamalarını sağlamak diğer yaygın stratejiler arasındadır. Ayrıca öğretmen adaylarının gözlemleme şansı buldukları öğretmen yetiştiricileri ve diğer rol modellerin de öğrenci algılarının önemli belirleyicileri arasında olduğu tespit edilmiştir. Ancak Nitel Kanıt Sentezi modelinde tanımlanan öğretim tasarımı ve geri bildirim stratejilerini kullanma düzeyinin diğer stratejilere göre daha düşük olduğu görülmüştür. Hepsi bir arada değerlendirildiğinde, Nitel Kanıt Sentezi modelinde belirtilen bilgi ve iletişim teknolojilerinin stratejileri ne kadar çok öğretmen yetiştirme programları tarafından dikkate alınır ve uygulanırsa, öğretmen adaylarının dijital oyun temelli öğrenme algılarında o kadar olumlu değişimlerin izlenebileceği sonucuna varılabilir.

Dolayısıyla bu çalışmanın sonuçları hem öğretmen eğitimcileri hem de öğretmen adayları için faydalı olabilecek bazı önerilerde bulunmuştur. Her şeyden önce, herhangi bir yeni teknolojinin uygulanmasının öğretmenlerin algılarıyla yakından ilişkili olduğunu akılda tutmakta fayda vardır. Yeni öğretim yöntemi veya materyali öğretmenler tarafından çok önemli bir nokta olarak görülmezse veya öğretmenler bazı

problemler nedeniyle bu yeniliklerle aşina olmazlarsa, yeni yöntemleri sınıfta kullanma şansı oldukça düşük olacaktır. Bu nedenle öğretmenlerin teknolojinin öneminin bilincinde olarak yetiştirilmesi, öğretmen yetiştirme programlarının olmazsa olmazlarından biri olmalıdır. Dahası, öğretmen adayları düzenli olarak teknoloji yeterlikleri hakkında yeterli geri bildirim alırlarsa, sınıfta bilgi ve iletişim teknolojileri stratejilerini kullanma potansiyellerini geliştirme olasılıkları da artar.

Ayrıca, öğrencilere öğrendiklerini ders planlarına uygulama konusunda daha fazla şans verilmelidir. Öğretmen eğitimcilerinin desteğiyle teknoloji entegrasyonu ile ders tasarlama fırsatları sağlanmalı ve bu ders planlarından nasıl yararlanabileceklerini öğrenmelidirler. Rol modelleri öğretmen adayları için olumlu bir ilişkiye sahip temel ilham kaynakları olduğundan, öğretmen eğitimcilerinin bakış açılarına birinci derecede önem verilmelidir. Teknolojinin etkin kullanımı hakkında düşünme şansına sahip olmak, diğer güzel örnekleri gözlemlemek,etkili teknoloji kullanım yöntemlerini incelemek ve nihayetinde kendi çalışmaları ve performansları üzerinde düşünmek ve planlamalar yapmak öğretmen adaylarının geleceği için faydalıdır. Ek olark, grup çalışması öğretmen adaylarını daha özgüvenli ve güvende hissettirdiği için teknoloji entegre etme algıları iyi yönde etkilenebilir ve işbirliği arttıkça hata yapma kaygısı azalır. Bilgi ve iletişim teknolojileri stratejilerinin sonununcusu olarak otantik deneyimler öğretmen adayları için oldukça önemlidir. Öğretmen yetiştirme programları sınıfta teknoloji kullanımının önemi konusunda onlara gerekli bilgileri verse bile, bu bilgiler deneyimlenmeden sadece teorik bilgi olarak kalırsa, tamamen öğrenme olasılığı çok azalacaktır. Bu nedenle öğretmen adayları olarak öğrencilere derslerinde öğrendiklerini gerçek öğretim ortamlarına dönüştürme ve uygulama şansı verilmelidir.

Ayrıca öğretmen adaylarının teknolojiyi etkin kullanma becerilerini kazanmaları yeterli olmayıp, teknolojiyi öğretimi ile nasıl birleştirebileceklerini bilmeleri gerekmektedir. Bu amaca ulaşmak için öğretmen adaylarının teknoloji destekli yeni öğretim yöntemlerini programlarına nasıl dahil edebilecekleri ve kendi ortamlarına göre hangi teknoloji entegrasyon stratejilerinin uygun olabileceği konusunda bilinç kazanmazı gerekir. Öğretmenlerin teknoloji entegrasyon becerilerini geliştirmek için öğretmen yetiştirme programlarının sunduğu dersler tek başlarına yeterli olmayabilir.

Bu yüzden eğitim programları ders saatleri ve ders sayıları arttırabilir, atölye çalışmaları, mikro öğretimler, paneller vb. gibi ek etkinlikler ekleyebilir.

Bu stratejiler bir arada düşünüldüğünde, neden önemli olduklarını bilmek kadar, bu stratejilerin nasıl uygulandığının da önemli olduğu düşünülmelidir. Bu durum öğretmen yetiştirme sürecinde teknoloji entegrasyonunun nitelikli ve farklı bir şekilde kullanılmasını zorunlu kılmaktadır. Bu nedenle, Nitel Kanıt Sentezi modelinde gösterildiği gibi etkili stratejiler olarak bulunan stratejilerden yararlanarak teknoloji entegrasyonunu teşvik etmeye yönelik iyi organize edilmiş öğretim yöntemleri öğretmen yetiştirme programlarında yer almalıdır. Ayrıca bu araştırma, öğretmen yetiştirme programları teknoloji dostu programlar uygular ve yukarıda bahsedilen bilgi ve iletişim stratejilerini kullanarak yeni materyaller sağlarsa, dijital oyun temelli öğrenimin öğretme sürecinin vazgeçilmez bir parçası olarak görülme olasılığının artabileceğini ortaya koymuştur. Dolayısıyla çağdaş ve yaratıcı bir yöntem olarak dijital oyun temelli öğrenme, dijital yerliler ve onların öğretmenleri için ortak bir ilgi alanı oluşturarak iyi bir eğitim yöntemi olabilir.

Yukarıda belirtilen önerilere ek olarak ileride yapılacak çalışmalar için de belirli öneriler de bulunmak faydalı olabilir. Öncelikle bu çalışma Türkiye'nin Ankara ilçesi ile sınırlıdır ve sadece bir akademik yarıyılda veriler toplanmıştır, daha kapsamlı araştırmalar öğretmen adaylarının zaman içindeki değişimlerini görmek için daha faydalı olabilir. Ayrıca bu süreçte katılımcı sayısı arttırılabilir. Ayrıca, bu korelasyonel çalışma, bilgi ve iletişim teknolojileri stratejilerinin algıları ile dijital oyun temelli öğrenme arasındaki ilişkiyi araştırmak için yalnızca öz-bildirim ölçümlerini kullanmıştır. Öte yandan, diğer araçlarla birlikte algılarını daha derinden anlamak için nitel ölçümleri dahil etmek daha iyi olabilir. Ayrıca, bu çalışma temel olarak mikro düzeyde stratejiler olan Nitel Kanıt Sentezi modelinin iç çemberine dikkat çekmeyi amaçlamıştır. Bu modelin bir parçası olarak kurumsal düzeydeki diğer stratejiler de gelecekte, kaynaklara erişim, eğitim personeli, kurumlar arasındaki korelasyon ve öğretmen adaylarını gelecekte teknoloji kullanımına hazırlamak için teknoloji planlaması ve liderliği dahil olmak üzere araştırılabilir. (Tondeur ve diğerleri, 2012). Son olarak, teknolojiyi sınıflara dahil etmenin en önemli paydaşlarından biri oldukları için öğretmen eğitimcilerinin bilgi ve iletişim teknolojileri stratejilerine yönelik

algılarının araştırılması başka bir ilgi noktası olabilir. Öğretmen eğitimcilerinin algılarını görmek için bakış açıları, kullandıkları stratejiler, karşılaştıkları zorluklar ve teknoloji entegrasyonunu teşvik etmek için kullandıkları yöntemler incelenebilir ve bu şekilde eğitim ortamlarına teknoloji kullanımı konusunda iyileştirmeler yapılabilir.

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**TEZİN ADI /** TITLE OF THE THESIS (**İngilizce** / English): THE RELATIONSHIP BETWEEN PRESERVICE TEACHERS' PERCEPTIONS TOWARDS THE USE OF ICT INTEGRATION IN TEACHER EDUCATION AND DIGITAL GAME-BASED LEARNING

**TEZİN TÜRÜ /** DEGREE: **Yüksek Lisans** / Master ☒ **Doktora** / PhD ☐

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