

Examination of prospective teachers' levels of using digital educational games

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Abstract

With the rapid development of technology, digital games have become an important part of the educational process. The purpose of this study was to investigate digital educational game usage behaviour in terms of demographic variables. The model of this study is a factorial pattern among multi-variant patterns that aim to reveal the effects of multiple independent variables together. In this study, prospective teachers' digital educational game perceptions were considered as independent factorial patterns to observe the differences between gender, class level, education program, playing digital games and duration independent variable categories. The study group of the research consists of 230 teacher candidates who continue their education at Inonu University Faculty of Education. Digital Educational Game Perception Scale was used in this study. Perceptive awareness and perceptive control behaviors of male students are higher than female students. Prospective teachers playing digital games have higher levels of emotional dimension, perceptive awareness, perceptive control behavior and behavioral dimension. When the playing time is taken into account, the emotional dimension and perceptive awareness levels of those who play games for more than 10 hours are higher. The research can then be expanded by the other researcher or the other by obtaining qualitative opinions.

Keywords: Digital Games; Digital Educational Games; Digital Games Using; Prospective Teachers

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1. Introduction

Game playing has also changed with technological developments and lifestyles. While the game activity was about humans imitating the natural events in the past, various tools such as computers, tablets and phones are used today for the game activities to occur in a virtual world (Z. Hazar & Hazar, 2017). Digital games act as the most important entertainment tool of the new generation. In addition to entertainment functions, digital games are used in teaching activities. Due to technological advancement, fewer spaces to play on the street, unsafe streets, the Covid-19 pandemic and the interests and expectations of the new generation, the tendency towards digital game-based teaching increased. The children born in 2000 and later are referred to as “Generation Z”, “Digital Generation” and “Digital Nomads” due to technological developments and children adapting to these developments (Sogut, 2020). This generation referred to with different names has more interaction with the digital world every day. Due to easy access to technology, almost all houses and every adult have tools such as computers, phones and tablets and young children consider these tools, not as an innovation but tools that always exist and are used in daily life. Due to ease of access and intense use in daily life, the age to use these tools is decreasing (Orman & Aricak, 2019). Nowadays, the web is a fundamental instrument within the field of life. Within the nonappearance of the web began to bother mankind such as physiological needs. The foremost prevalent utilize of the web social organizing locales but due to the predominance of versatile gadgets the over the top utilize of social organizing destinations has gotten to be a worldwide wonder (Yilmaz & Akkaya, 2016).

Individuals meet various needs other than the physiologic needs from this world and shape the digital world based on their interests and needs. Teachers need to update themselves, be good digital users as much as the mass they address and integrate this to teaching environments. Although the game playing type changed with digitalization from past to present, the purpose of the game, entertainment and voluntariness did not change (M. Hazar et al., 2016). Similarly, although children verged towards different game types, their interests and attitudes towards games never changed. It is a fact that technology has negative properties as much as positive ones. But educators can turn the crisis into an opportunity and use the technology in favour of the children instead of constantly expressing the negative effects, complaining about it or abstracting the children from technology. To do that, a good education strategy must be planned. Additionally, the education environments must be designed to meet the properties of this era and teachers need to develop themselves accordingly. Otherwise, the teachers will be behind the developments and children and they will lose their functionalities (H. Yuksel, 2019). The importance of methods and techniques in the classes are huge for the students to have effective and permanent learning. With different methods and techniques, students can participate in the process more effectively, the class is no longer monotonous and apprehension becomes easier (Erkan, 2019). One of the alternatives methods that can be used in the education environment is educational digital game use. With educational digital games, the skills and thinking skills related to the class develops, the situations and phenomenon are better understood with concretized data and the complex problems and structures are solved easier. Additionally, students get cooperative learning opportunities since multiplayer games can be played. Students are extremely willing in teaching activities when these games are used. Additionally, providing different game types (action, simulation etc.) and using different methods offer various alternatives to students in the learning process. The educational digital game use which is one of the methods with effective latent learning can be used with other methods and techniques and more effective and permanent learning can happen (Agirgol, 2020). While the entertainment and competition in digital games that make an individual spend a lovely time attract that individual, the desire to win and avoidance to lose attract the individual more inside the game. The player spends all the power to win the game and

devises a plan and strategy to win. The individual segregates adrenalin in this process and the blood circulation increases. The possibility to win motivates and satisfies the individual and the player gets away from the troubles and stress of daily life even just for a moment (Saglam, 2019). Digital games that even attract and entertain adults are an amazing entertainment tool for children and a material that helps teachers to teach when correctly used. Therefore, although the teachers do not use games in the teaching environment, teachers need to give digital games a chance in the teaching environments due to accelerated change in the game with the pandemic. Distant learning laid the ground for teachers and students to rapidly and highly adapt technology as a solution during the crisis (Telli & Aydin, 2021). Although individuals followed the physical distance rules in the process to isolate themselves, using the digital environment has been the most effective solution for humans being a social beings, needing interaction with the environment and avoiding any hindrance for education and work life. Digital environments gained an effective role as the pandemic precautions are applied and a new lifestyle is followed (A. Ozturk, 2021).

Game-based learning environments which have been always preferred in the teaching environments from past to present is related to Vygotsky's Social Constructivist learning theory that the child re-interprets the old knowledge with the new one. Educational games are often preferred at the elementary school level; here, students take an active role and develop their imagination and synthesis skills in the process. The previously learned knowledge is reinforced with these games and the incorrect knowledge can be corrected (Ozturk, 2019). Due to the change of the game in today's world, it is possible to say that educational digital games used in the teaching environment are tools that contribute to a social learning process and active learning and increase motivation. These games are created and used for educational purposes and consider the curriculum. Especially the interests of the new generation, highlighting entertainment and curiosity are considered, the idea to use digital games for educational purposes is consolidated. Compared to traditional teaching, the most important advantage of these games is to facilitate learning, provide permanent and effective learning, increase motivation, entertain and contribute to developing a positive attitude towards the class (Bag, 2020). Using a computer and different technological tools in the education environment enables the development of 21st-century skills and answer the students' interests and expectations. When the teachers' guide role and students' more active participation in today's education environment are considered, digital games occur as a different alternative for students and teachers (Ozturk, 2019). Digital games are highly attractive activities for children since pre-school and elementary school children need concrete data and materials, digital games offer colourful and entertaining figures to children and spending time with these games gives pleasure. It is seen that the game-based learning approach which dates back to the 1960s and is supported by technological developments have various positive effects on students' performance, students' attitudes towards school and learning. Additionally, it is known that digital games are effective on students' spatial skills, academic participation, attitudes towards collaborative learning, social skills, academic success and motivation (Altinpulluk, 2021). With educational games, students' strategy development, decision-making, communication and attention skills develop, students have fun and interact with their environment (Erol et al., 2021). It is known that digital games have positive effects on children with attention deficit and hyperactivity disorders (Cakici, 2021).

There are certain risks for students when games are used in education. If students' readiness is not sufficient, using games in the learning environment can cause misconceptions (Zorlu & Karamustafaoglu, 2019). Therefore, there are certain points teachers should consider. To minimize the negative effects teachers might face when using games in the teaching process and to maximize the

efficiency of this technique, teachers should first make a good plan and the selected games must match with the class learning outcomes (Ersoy, 2021).

Although the learning environments change, the existence of games in these environments has always been there. The child learns without noticing with games. Therefore, game usage in an educational environment is a highly effective method. When the children's developmental properties and attention span are considered for the elementary school period, it is important to place the game inside education. The game which is seen as an entertainment activity for children from the outside is in fact a highly serious work. Because the children apply what they learn from the real world to the game world, gain experience and discover (Zorlu & Karamustafaoglu, 2019). Teaching with games which are mostly preferred in classes with small age groups increase the students' performance and has a positive effect on students' attitudes towards education. The reason for that is the children in this age group can learn concretized information easier and apprehend hard subjects easier with the game. Integration of the technology in the game environment and today's children using technological tools routinely in their daily life just like any tool caused digital to take an important part in children's lives. Especially, it has been used in elementary school level classes (Agirgol, 2020). The purpose of gamification in the education environment is to integrate the game elements into the education environment and to create behaviour change in students (Kara, 2021). When today's conditions and technological developments are considered, digital games play a highly effective role in formal and non-formal learning. Especially, the children born in the last 20 years are the most effective users of digital tools. The areas of interests, entertainment and learning styles of these individuals are shaped accordingly. Educational digital games that can be used in the education process and significantly contribute to these processes have not reached to sufficient level in terms of compatibility with the learning outcomes and the teachers have insufficient knowledge about the existing games. Digital games are regarded only as an entertainment and free-time tool and the educational function is disregarded. Digital games which often cause addiction and considered as harmful activities can facilitate the teachers' tasks and create an entertaining learning environment for the students when these games are transformed into opportunities and used in education. As a result of the research, the educational game software supported teaching method used, it was seen that the academic scores of the students were in favor of the experimental group and that the educational game application did not make any difference in the attitudes of the students towards computer games (Guner et al., 2021).

The purpose of this study was to investigate digital educational game usage behaviour in terms of demographic variables. The answers for the following sub-problems were sought by considering gender, class level, program, digital gameplay and time variables:

1. Do prospective teachers' digital educational games use emotional dimension (ED), perceptive benefit (PA), emotional control (DK) and behavioural dimension (ED) sub-dimensions
 - a. show a significant difference for gender?
 - b. show a significant difference for class level?
 - c. show a significant difference for an education program?
 - d. show a significant difference for playing digital games?
 - e. show a significant difference for playing digital games duration?

2.Method

The model of this study is a factorial pattern among multi-variant patterns that aim to reveal the effects of multiple independent variables together (Basol, 2008). In this study, prospective teachers' digital educational game perceptions were considered as independent factorial patterns to observe the differences between gender, class level, education program, playing digital games and duration independent variable categories. The study group of the research consists of 230 teacher candidates who continue their education at İnönü University Faculty of Education.

2.1.Data Collection Tool

Digital Educational Game Perception Scale developed by Sarigoz et al. (2018) was used in this study. "Exploratory and confirmatory factor analyses revealed that the scale had four dimensions. In item total correlation calculation of the scale it was observed that all the items were above .40, item factor loads varied between .51 and .68, Cronbach Alpha internal consistency coefficient was .78 and test retest correlation was .88. Significant relations were in the calculations regarding the correlation analyses of the scale" (Sarigoz et al., 2018).

2.2.Data Analysis

Emotional Dimension (ED), Perceptive Benefit (PA), Perception Control (PK) and Behavioural Dimension (BD) sub-dimensions that reflect the perception towards digital educational games are the dependent variables of the study while gender, class level, education program, playing digital games and duration are the independent variables. Since the study scale sub-dimensions have multiple dependent variables and there is more than two independent variables, Factorial MANOVA among multivariate analysis was used. First, data correction steps were followed, outlier and lost values were checked and necessary assumptions for MANOVA were tested. For outliers, the existence of Z value outside [+3, -3] range was investigated. There was no outlier or lost values. Kolmogorov Smirnov test was applied for normality test however, it was observed that KS results were significant and all dependent variables other than ED (.98, $p > .05$) variable did not show normal distribution for KS test. However, skewness coefficients were analysed and the skewness of the data from normal was evaluated. Since skewness coefficient was in [-1, +1] range, fundamental analysis were obtained since (PA=.05, PK=-.21, BD=-.13) showed no significant skewness from the normal although these values do not show a perfect normal distribution.

A medium level relationship is expected between dependent variables (Huberty & Morris, 1989) and Ramsey (1982) stated that as the relationship between dependent variables increase, the power of MANOVA decreased (as cited in, Field, 2009). When the correlation coefficients between the dependent variables in this study were investigated, the coefficients changes between .46 and .26. There is a medium level acceptable relationship between the variables. Mahalanobis distance values were calculated for the multiple normality assumption (Pallant, 2005; Tabachnick & Fidel, 2007). Since calculated Mahalanobis value was larger than .001 and since it was not an outlier, the multiple normality was met. The homogeneity of the variance was calculated with Levene test as larger than .05 (Field, 2009) and the intergroup variance was observed as equal for calculated variance value. For the last assumption, Box's M test or variance-covariance matrix homogeneity was tested. It was observed that the tested Box's M test p value was smaller than the significance criteria .001 (Secer, 2015). However, since Allen and Bentler (2008) suggested that Box's M test results can be disregarded when the sample size is 30 or higher, the analysis were conducted by disregarding this situation.

After the fundamental statistic tests, the intergroup distribution and the distribution of the sample numbers in the groups were investigated. Since the group numbers in this study were not equal, more

resistant Pillai's Trace index was interpreted. Pillai's trace is considered as one of the strongest statistics changing between 0 and 1 (Olson, 1974).

3. Findings

Prospective teachers digital educational game perception *MANOVA results for gender, class level, education program, playing digital games and playing digital games duration variables*

Pillai's trace value was considered to determine whether the dependent variables in this study differentiated between sub-groups. The test results for Pillai's trace values are reported in Table 1

Table 1. Pillai's trace values

Group	Pillai's Trace	F	Hypothesis sd	Error sd	p
Gender	.084	5.13	4	225	.000*
Class Level	.062	1.81	8	450	.07
Program	.018	1.01	4	225	.40
Digital Game	.14	9.51	4	225	.000*
Duration	.21	3.12	16	900	.000*

*p<.01

When Table 1 was investigated, the dependent variables in this study showed significant difference for gender (Pillai's Trace=.084; $F_{(4, 225)}=5.13$, $p<.01$), playing digital games (Pillai's Trace=.12; $F_{(4, 225)}=9.51$, $p<.01$) and duration (Pillai's Trace=.21; $F_{(16, 900)}=3.12$, $p<.01$) variables. On the contrary, there was no significant difference for class level (Pillai's Trace=.062; $F_{(8, 450)}=1.81$, $p>.05$) and education program (Pillai's Trace=.018; $F_{(4, 225)}=1.01$, $p>.05$) sub-dimensions.

One-way ANOVA test (Multivariate ANOVA) was analysed for gender, digital game playing and duration variables which showed significant difference and the results are given in Table 2

Table 2. One factor ANOVA results for intergroup difference between prospective teachers' digital educational game perception sub-groups

Independent Variable	Dependent Variable	F	p	Sd	Difference
Gender	ED	1.57	.21		
	PA	5.54	.01		
	PK	13.8	.00	4	1
Digital Game	BD	.51	.47		
	ED	7.81	.00		
	PA	24,9	.00	06	1
	PK	21,1	.00	63	
Duration	BD	9.89	.00		
	ED	4.35	.00		More than 10 hours- Less than 1 hour, 1-3, 4-6
	PA	5.97	.00		More than 10 hours- Less than 1 hour, 1-3, 4-6
	PK	1.59	.18		-
	BD	7.19	.00		More than 10 hours- Less than 1 hour, 1-3, 4-6,

When Table 2 is investigated, it can be seen that perceptive awareness (PA) ($F_{1/228}=5.54$, $p<.05$) and perceptive control (PK) ($F_{1/228}=13.84$, $p<.05$) sub-dimensions showed significant differences for gender variables. When the perceptive awareness dimension was investigated, the average for male students was 16.95 and the average for female students was 15.95. For the perceptive control dimension, the average for male students was 21.82 and the average for female students was 19.86. Thus, the perceptive awareness and perceptive control of male students were higher than female students. There was no significant difference between genders for emotional dimension (ED) ($F_{1/228}=1.57$, $p>.05$) and behavioural dimension (BD) ($F_{1/228}=.51$, $p>.05$).

When the results for another categoric variable was investigated, it was seen that emotional dimension (ED) ($F_{1/228}=7.81$, $p<.05$), perceptive awareness (PA) ($F_{1/228}=24.91$, $p<.05$), perceptive control ($F_{1/228}=21.16$, $p<.05$) and behavioural dimensions (BD) ($F_{1/228}=9.89$, $p<.05$) showed significant difference than playing digital game variable sub-groups. When the averages were considered for the awareness dimension, the emotional dimensions of the students who play digital games ($\bar{X}=22.57$) were higher than the students who do not play digital games ($\bar{X}=21.24$). Similarly, for perceptive awareness and perceptive control variables, the students who play digital games ($\bar{X}_{PA}=17.24$, $\bar{X}_{PK}=21.58$) have higher scores than the students who do not play digital games ($\bar{X}_{PA}=15.47$, $\bar{X}_{PK}=19.48$). Thus, the students who play digital games have higher perceptive awareness and perceptive control behaviours. A similar result was observed for the last dimension which is the behavioural dimension. The students who play digital games ($\bar{X}=9.99$) have higher scores than the students who do not play digital games ($\bar{X}=2.29$).

Time was the variable that showed a significant difference for sub-dimensions. When the duration variable was investigated, it was seen that emotional dimension (ED) ($F_{4/225}=4.35$, $p<.05$), perceptive awareness (PA) ($F_{4/225}=5.97$, $p<.05$) and behavioural dimensions (BD) ($F_{4/225}=7.19$, $p<.05$) showed significant difference than duration variable sub-groups. When the perceptive awareness dimension was investigated, it was observed that individuals playing games for 10 hours and above ($\bar{X}=25.27$) had higher emotional dimension behaviours than 1 hours or less ($\bar{X}=20.63$), 1-3 hours, 1-3 saat ($\bar{X}=21.55$) and 4-6 hours ($\bar{X}=21.47$). A similar situation was observed for perceptive awareness dimension. Individuals playing games for 10 hours and above ($\bar{X}=19.72$) had higher perceptive awareness than 1 hours or less ($\bar{X}=15$), 1-3 hours ($\bar{X}=15.88$) and 4-6 hours ($\bar{X}=16.15$). For the last sub-dimension, the behavioural dimension for playing games for 10 hours and above ($\bar{X}=11.90$) had higher behavioural dimension than 1 hour or less ($\bar{X}=10$), 1-3 hours ($\bar{X}=9.47$), 4-6 hours ($\bar{X}=9.27$) and 7-9 hours ($\bar{X}=10.06$).

4. Conclusions, Discussion and Recommendations

Perceptive awareness and perceptive control behaviors of male students are higher than female students. Prospective teachers playing digital games have higher levels of emotional dimension, perceptive awareness, perceptive control behavior and behavioral dimension. When the playing time is taken into account, the emotional dimension and perceptive awareness levels of those who play games for more than 10 hours are higher. Within the scope of digital games, many studies have been carried out with teachers, students, parents, teacher candidates and other education stakeholders (Akkaya et al., 2019; Akkaya et al., 2021; Akkaya & Kapidere, 2021; Budak, 2020; Demir & Hazar, 2018; Demirel et al., 2019; Devci Topal & Colak, 2021; İsikoglu et al., 2021; Kavlakci, 2020; Kaya, 2019; Kirmusaoğlu, 2020; Sogut, 2020; Yigitoglu, 2018). In the study, which aims to determine the opinions of the primary school teacher candidates on the use of educational computer games in

mathematics teaching, the prospective classroom teachers were asked that educational computer games will make the lesson permanent and fun, that the mathematics lesson will make the lesson popular, reinforce the learned, but in addition to these, some negative situations such as addiction, physical disorders, and difficulty in classroom management. They expressed the opinion that it will create. In addition, it was concluded that primary school teacher candidates have a positive attitude towards the use of educational computer games in lessons, but they consider themselves inadequate in this regard (Topcu et al., 2014). In the study, which aimed to examine the opinions of Turkish teacher candidates about digital games, it was seen that there was a significant difference between teachers' views on educational digital games, their age, gender, time spent on the Internet, the environment they grew up in, the number of books they read annually, their grade levels and grade point averages. In addition, it was concluded that teacher candidates have a positive attitude towards educational digital games and that they can use these games in lessons (Ustabulut & Kana, 2021). In the study, which examined the effects of educational digital games used in the distance education process on the primary literacy process of students, it was concluded that the group using digital games was more successful in the first literacy process (Basaran & Kilincarslan, 2021).

In the research conducted to determine the prospective teachers' use of digital educational games, it was concluded that there was a significant difference according to gender and the department they studied. This difference is in favor of male teacher candidates and social studies teacher candidates (Alkan & Mertol, 2019). In the research, which aims to determine the opinions of prospective teachers on the development of a digital game and its adaptation to educational environments, they stated that the games developed with the digital game development software called KODU will make the lesson fun, reinforce and make permanent the learned, and provide active participation in the lesson. In addition, prospective teachers stated that they wanted to develop games using this software (Donel Akgul & Kilic, 2020). According to the study, which aims to examine the effect of digital games on English vocabulary teaching, it has been concluded that teaching using digital games in English vocabulary teaching is more effective than traditional methods and increases student success (Kusucuran, 2020). According to the research, which aims to examine the effects of the use of educational digital games in education on students' academic achievement, attitudes and motivations towards the course, and their ability to use technology, it has been seen that the use of educational digital games causes a significant increase in the success of the course and increases the motivation of the students. Attitudes towards the course changed equally in both the experimental and control groups. There was a significant increase in technology use skills in favor of the experimental group (Sabirli, 2018). With the help of an argumentation-oriented educational digital game, it was found that the digital game developed in the research conducted with the aim of examining the conceptual understanding levels, scientific thinking habits and argumentation skills of primary school 4th grade students positively affects the students' conceptual understanding levels; It has been concluded that it affects argumentation and scientific thinking habits to a certain extent (Bag, 2020). In the study, which aimed to examine the effect of educational digital games on students' mathematics achievement and attitude, it was observed that educational digital games increased their mathematical success, but the method applied did not make a difference on the attitude (Yavuzkan, 2019).

When the effect of playing digital games and playing digital games on the use of educational digital games is examined, it can be suggested that with the developing age, digital game development course should be included in the undergraduate curriculum in order for prospective teachers to benefit from more educational digital games in the lessons, and prospective teachers should be encouraged by paying attention to the effects of digital game use. The research can then be expanded by the other researcher or the other by obtaining qualitative opinions.

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