

Statistical Determination of Parents' Use of Gamification Applications According to the Technology Acceptance Model

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Abstract. Gamification is used to motivate the targeted behaviors using game elements in non-game environments through the implementation of designs outlined in the theories of behavior. The main purpose of this study is to examine the use of gamification applications by parents based on the Technology Acceptance Model 2. The study results show that the use of gamification applications increases parenting performance, productivity, and effectiveness, that parents will use gamification applications in the future and that they can easily explain the results of the use of gamification applications to others. It shows that parents are not obliged to use gamification in their occupations and that people who influence their behaviors do not think that they should use gamification applications. The study uses a quantitative approach and data analysis is performed using the SPSS program. The data are analyzed and interpreted by tabulating frequency, percentages, t-test and Anova tests. Future studies will provide training on how parents can use gamification applications for their children's education within the framework of the Technology Acceptance Model 2.

Keywords: Technology Acceptance Model · Gamification · Application · Parent.

1 Introduction

The concept of the game is as old as human history. It has been determined by numerous researchers that digital games facilitate learning [2], motivate [7], increase social interaction [9], and create a fun environment [12, 14]. One of the methods that motivate individuals in the education process is gamification. Besides, its purpose is to facilitate the individual's learning, while also increasing their enjoyment and the efficiency of the education. Gamification was defined by Kapp as "the use of game-based mechanics, aesthetics and game thinking in order to connect, motivate, improve learning and solve problems" [11]. In fact, in the literature, it is emphasized that games can be beneficial in providing different

learning experiences and can help students to reach their potential [13]. Parents' awareness, acceptance of technology and use of gamification applications will support their children's educational processes.

The Technology Acceptance Model 1 is based on the "Theory of Reasoned Action" [6]. The Technology Acceptance Model (TAM) was developed by Davis [3] to explain computer-usage behavior. The theoretical basis of the model was Fishbein and Ajzen's [6] Theory of Reasoned Action (TRA). The Theory of Reasoned Action argues that behavioral intention is effective in demonstrating an individual's behavior and that attitudes towards and responses to that behavior in society affect behavioral intention. Although the Theory of Reasoned Action provides a general framework for understanding voluntary behavior, it cannot fully serve specific beliefs such as adaptation to information technologies. For this reason, a more comprehensive approach for identifying critical beliefs about the adoption of technology in organizations has been developed, namely Perceived Ease of Use and Perceived Usefulness [3]. These two beliefs are also influenced by external variables such as design elements and information technology systems. However, considering that the system is useful, both the attitude towards use and the Intention to Use as well as Perceived Ease of Use also affects the attitude and Perceived Usefulness to use the system [3]. The Technology Acceptance Model 1 provides an effective way of modeling the impact of one's beliefs, attitudes and intentions towards technology. Perceived Usefulness is related to the extent to which the technology used by the individual will increase their work performance [4]. Perceived Ease of Use is related to the level of effort an individual will be required to apply when using the new technology. In the model, this situation is associated with the intention to Use and Perceived Usefulness [4]. If the system is easy to use, the individual's self-efficacy belief that they will be able to use the new system will be high [1]. Individuals with high self-efficacy towards using new technologies have high Intentions to Use technology and Perceived Usefulness levels [4]. Although the Technology Acceptance Model 1 incorporates external variables, it does not pay enough attention to the 'Subjective Norm' mentioned in the Theory of Reasoned Action. Therefore, Technology Acceptance Model 1 was revised and Technology Acceptance Model 2 was created [15]. Technology Acceptance Model 2 contains more external variables than the Technology Acceptance Model 1. The social forces affecting the Perceived Usefulness and Intention to Use included in the model are Subjective Norms and Image as well as Experience and Voluntariness. The cognitive processes affecting Perceived Usefulness and Intention to Use included in the model are Job Relevance, Output Quality, Result Demonstrability and Perceived Ease of Use [15]. The factors related to the social process included in the Technology Acceptance Model 2 are shown in Fig.1. [15].

Subjective Norm: The Subjective Norm is concerned with what the individual who exhibits the behavior thinks about the behavior of people who are important to the individual at the stage of demonstrating this behavior. If the people who are important to the individual are satisfied with the behavior when the behavior is shown, the attitude of the individual to this behavior will be positively affected

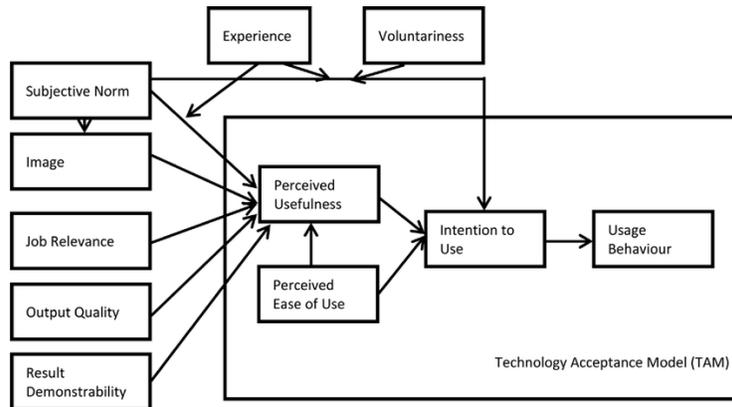


Fig. 1. Technology Acceptance Model 2 [4].

and they will intend to continue this behavior. Therefore, Subjective Norm has a positive relationship with Perceived Usefulness and Intention to Use.

Experience: In Technology Acceptance Model 2, it is stated that the relationship between Subjective Norm and Perceived Usefulness and Intention to Use decreases with time [15]. As the experience increases, the importance of the views of the people who are important for the individual about the technology used by the individual will begin to diminish [15]. This is because the individual will internalize technology and realize its benefits.

Voluntariness: Volunteerism undertakes the role of external variability between Subjective Norm and Perceived Usefulness in Technology Acceptance Model 2. It is stated that the principle of volunteering is mandatory when using a new technology [8].

Image: The image refers to the status that the individual will have within the institution where the technology is used [15]. If an individual thinks that the technology he/she uses will increase his/her standing within the organization and will improve their status, he/she perceives the technology he/she uses to be useful. Therefore, the Image directly affects the Perceived Usefulness.

Job Relevance: If the individual believes that he/she can associate the technology with his/her profession and apply it to his/her job, he/she will think that the technology he/she uses is beneficial. For this reason, a relationship with the Profession directly affects Perceived Usefulness [15].

Output Quality: Output Quality is concerned with how effective the technology used by the individual is in completing work-related tasks. The individual will choose the best performing technologies from the presented technologies related to the profession. Therefore, Output Quality directly affects Perceived Usefulness [15].

Result Demonstrability: The presentability of the results is related to the observation of the effect of the technology used by the individual. If the individual can interpret and share the results of the effect of the technology he/she

uses, there will be an increase in the perception of benefit with regard to this technology. Therefore, there is a positive relationship between the Result Demonstrability and Perceived Usefulness [15].

Perceived Ease of Use: Technology Acceptance Model 2 has maintained the structure of Perceived Ease of Use outlined in Technology Acceptance Model 1. The more easily the technology can be used, the more the perception of benefit and the Intention to Use it will increase together [15].

In summary, Technology Acceptance Model 1 [3] and Technology Acceptance Model 2 [15] provide a structural model for the acceptance of technology through social and cognitive variables. Technology Acceptance Model 2 has emerged and has been used in many types of research with the social and cognitive variables added to the Technology Acceptance Model, which was developed based on the Theory of Reasoned Action.

According to Technology Acceptance Model 2, parents' use of gamification applications is important for their children to support their educational processes. It is also the responsibility of the parents to raise their children's awareness of the use of digital technology and educational gamification applications. The "material role" of parents includes activities such as purchasing a computer and providing Internet access at home. On the other hand, the "symbolic role" is related to defining the rules of internet use at home [10]. Parents are expected to adopt their material and symbolic roles and use technology to contribute to their children's educational processes. In this study, parents' opinions were taken regarding gamification applications based on Technology Acceptance Model 2.

In this case, it is important for the parents of the future to accept that gamification applications can be beneficial for their children and should take behavioral actions to use this technology in terms of increasing satisfaction and improving skills. However, the following questions come to mind. What are the levels of parental acceptance in terms of the use of gamification applications? Is there a significant difference between the mixed and online groups on the basis of their level of acceptance in the use of gamification applications?

2 Aim of the Research

The main purpose of the study is to examine the acceptance levels in terms of parents' use of gamification applications according to the Technology Acceptance Model 2 and to determine whether there is a significant difference between the mixed and online groups in terms of the use of gamification applications.

2.1 Participants

The study group of the study consisted of the parents of children attending Istanbul Aydin University Children's University in the 2018-2019 fall term. To identify the groups, the parents of all children enrolled in the Children's University were firstly called and informed about the education. Parents were asked in

which group (mixed and online) they would like to receive gamification education. The brochure prepared for the education was sent to the parents' e-mail addresses and they were asked to send an e-mail stating which group they would like to join. The study group consisted entirely of volunteer parents. Finally, a total of 25 parents in the mixed group and 23 parents in the online group participated in education. The parents in the mixed group attended the training in the computer laboratory of Istanbul Aydin University every Saturday for 8 weeks. Parents in the online group participated in online training on Thursday evenings for 8 weeks

2.2 Gender

Table 1 shows the gender distribution of the parents. As seen in Table 1, 80% of the parents (f=20) were female while 20% (f=5) were male in the mixed group. Additionally, 73.9% of the parents (f=17) were female while 26.1% (f=6) were male in the online group.

Table 1. Gender Distribution

Gender	Mixed Group		Online group	
	F	%	F	%
Female	20	80.0	17	73.9
Male	5	20.0	6	26.1
Total	25	100	23	100

2.3 Age

Table 2 shows the age distribution of the parents. The age of the parents ranged from 30 to 59 years. As shown in Table 2, in the mixed group, 32% (f = 8) of the parents were in the 35-39 age group, 56% (f=14) were in the 40-44 age group, 4% (f=1) of the parents were in the 45-49 age group, 4% (f=1) of the parents were in the 50-54 age group, and 4% (f=1) of the parents were in the 55-59 age group. In the online group, 4.3% (f=1) of the parents were in the 30-34 age group, 21.8% (f=5) of the parents were in the 35-39 age group, 56.6% (f=13) of the parents were in the 40-44 age group, and 17.3% (f=4) of the parents were in the 45-49 age group. Mothers comprised the majority of the participants. Research on parent-child interaction mainly focuses on mother-child interaction [5].

Table 2. Age Distribution

Age	Mixed group		Online group	
	F	%	F	%
30-34	0	0	1	4.3
35-39	8	32.0	5	21.8
40-44	14	56.0	13	56.6
45-49	1	4.0	4	17.3
50-54	1	4.0	0	0
55-59	1	4.0	0	0
Total	25	100	23	100

2.4 Practice

The web address of uzem.aydin.edu.tr, which is used by the Distance Education Center of İstanbul Aydın University was chosen to create a Gamification Education course for the parents. uzem.aydin.edu.tr is a MOODLE course content management system. Since Distance Education Programs are conducted through this address, it is considered as an appropriate environment where the course notes of Gamification Education can be shared and online courses can be held.

A request was made to the İstanbul Aydın University, UZEM Directorate to create an education folder on the address to be used to allow the parents to register in the system and a trainer to be appointed. After the course definitions were completed, the education folder “Gamification Education for Parents” was created in the system under the course categories where all course files and materials would be included. The education itself was divided into 8 weeks, and at the beginning of each week, the relevant materials were added along with online course registrations, which were made available to parents. After the course environment was prepared technically, the materials and applications to be used for the education were determined each week, the gamification applications were made with the parents during the course, the documents were shared with the parents and the education notes were uploaded onto the system. Attention was paid to ensure that all the selected practices were directly related to gamification.

The mixed group parents' lessons were held every Saturday in Block D2309 at İstanbul Aydın University. The mixed group parents were taught in the computer lab. Internet access was provided wirelessly for parents who did not have internet functionality on their mobile phones. The lessons were realized by the teacher opening the computer and projecting the screen onto the wall through and the learners followed each step and applied what they learned. In addition to the presentations or written materials used for the course, the environments to be taught were explaining them step by step to the parents. The parents of the online group followed the lessons from the educational environment established on uzem.aydin.edu.tr. Lessons were held online every Thursday evening am 17.30 for 8 weeks. Parents were asked to join uzem.aydin.edu.tr by clicking on the link for that week's course during the education hours. In order to inform the

parents who were using the Moodle system for the first time to make this process smoother and to ensure that they used it effectively, the Learning Management System for Parents (MOODLE) user manual was prepared.

The interaction environments of the mixed and online group participants were provided via the group called Gamification Education for Parents opened on Facebook. WhatsApp groups were also created to strengthen communication for the mixed and online groups and to share the course link with the online group. Through WhatsApp, parents were able to conduct one-to-one communication with the educator during the education process. In particular, parents who participated online were asked to download Flash Player 13.0 or higher on their phones or computers to connect with Adobe Connect and participate in the education program. Communicating via this process enabled problems to be solved quickly.

During the 8-week education period, “Game Elements, Effects of Gamification, Gamification Tools and Technologies, Modern and Digital Gamification Examples, Teaching Gamification Applications, Positive and Negative Effects of Digital Games on Children, Digital Game Addiction, Digital Guidance to Families, and Digital Parenting” were all taught. Information about the gamification applications such as Classdojo, Duolingo, Kahoot, Memrise was given to the parents and they were asked to create accounts so they could use them at home with their children. At the end of the 8-week education period, a survey was prepared based on the Technology Acceptance Model 2 to determine whether there was a significant difference in the acceptance levels of the use of gamification applications among the mixed and online group parents.

2.5 Instruments

The survey used in the research consists of 26 phrases about the parents’ technology acceptance model survey tool developed by the researchers. The items in the survey were determined according to Technology Acceptance Model 2. In the survey prepared according to Technology Acceptance Model 2, 3 items were related to Output Quality, 3 items related to Image, 4 items related to Perceived Usefulness, 3 items related to Job Relevance, 3 items related to Subjective Norm, 3 items with Intention to Use, 4 items with Result Demonstrability, and 3 items related to Perceived Ease of Use. The survey was reorganized according to the opinions of eight different experts in order to determine the suitability, applicability, and comprehensibility of the study. The Cronbach’s alpha coefficient of the questionnaire prepared according to the 5-point Likert-type was 0.82. Demographic questions were added by the researcher at the beginning of this survey.

2.6 Data Analysis

The data obtained from the research were analyzed using the SPSS 23 program. Data are given as percentage (%), average (M), frequency (f), standard deviation (SS). The independent samples t-test was used for the analysis of the collected

data. The general average was taken into account in explaining the differences of the data. The reason for preferring these methods is that the number of participants in each group was similar.

3 Results & Discussion

This section includes a comparison of the mean values of the views regarding how parents' use of gamification applications will have a positive impact in terms of technology adoption and between groups.

3.1 Comparison of Technology Acceptance Results for Gamification Applications of Mixed and Online Group Parents

Table 3 reviews the average and standard deviation of the mixed and online group parents' opinions for the technology acceptance results for gamification applications.

Table 3: Comparison of technology acceptance results for gamification applications of mixed and online group parents

No Items	Mixed Group		Online Group	
	Mean	StD.	Mean	StD.
1. I think that parents who use gamification applications have better prestige than those who do not.	3.92	1.04	3.91	.95
2. I think that parents who use gamification applications have a better profile.	4.00	0.91	4.22	.74
3. The use of gamification applications is an indicator of status in parenting.	3.76	1.20	4.22	.90
4. The use of gamification applications is important in my profession.	3.68	1.22	3.30	1.43
5. My profession is related to the use of gamification applications.	3.40	1.29	3.17	1.37
6. In my profession, the use of gamification applications is a must.	2.68	1.28	2.13	1.46
7. I think the quality of the materials in using gamification applications is high.	4.04	0.84	4.74	.54
8. I think that learning outcomes have high quality when using gamification applications.	4.36	0.86	4.78	.52
9. I think that by using gamification applications, targeted learning outcomes can be achieved more easily.	4.44	0.51	4.78	.52

10.	I can easily explain the consequences of using gamification applications to others.	4.52	0.71	4.96	.21
11.	I can easily discuss the consequences of using gamification applications with others.	4.52	0.65	4.87	.34
12.	The consequences of using gamification applications are understandable to me.	4.68	0.48	4.87	.46
13.	I can discuss with others whether the use of gamification applications is useful or not.	4.60	0.65	4.83	.39
14.	People who influence my behavior think that I should use gamification applications.	2.64	1.11	2.09	.90
15.	People who are important to me state that I need to use gamification applications.	3.00	1.26	2.04	.88
16.	I think using gamification applications will increase my value in the eyes of other people.	3.48	1.33	3.57	.95
17.	The use of gamification applications improves parenting performance.	4.48	0.65	4.87	.34
18.	The use of gamification application increases my parenting productivity.	4.40	0.96	4.91	.29
19.	The use of gamification applications increases my effectiveness in parenting.	4.60	0.65	4.87	.34
20.	The use of gamification applications is useful for parents.	4.52	0.59	4.91	.29
21.	Gamification applications are easy to use.	4.44	0.71	4.57	.66
22.	I don't have to use a lot of effort when using gamification applications.	3.84	0.80	2.09	.60
23.	Gamification applications are understandable and trouble-free.	4.12	0.73	4.57	.59
24.	I will use gamification applications in the future.	4.72	0.46	4.30	.56
25.	I will participate in various trainings to learn gamification applications.	4.36	0.64	4.30	.56
26.	I will investigate more to learn gamification applications.	4.60	0.50	4.43	.51

The responses of the parents under the Image items when the items were determined according to the Technology Acceptance Model 2 were analyzed; It has been revealed that parents who use gamification practices have a better image than parents who do not. The mean and standard deviation values of the mixed and online group parents given to the Image items are as follows: I think

that parents who use gamification applications have a better image than those who do not. (Mixed group $M=3.92$, $SD=1.04$, Online group $M=3.91$, $SD=.95$); I think that parents who use gamification applications have a better profile. (Mixed group $M=4.00$, $SD=0.91$, Online group $M=4.22$, $SD=.74$); The use of gamification applications is an indicator of status in parenting. (Mixed group $M=3.76$, $SD=1.20$, Online group $M=4.22$, $SD=.90$).

When the Job Relevance items were examined, it was concluded that parental gamification applications did not have much relevance to their occupations and that their use in their occupations was not compulsory. Mean and standard deviation values given by the mixed and online group parents to the Job Relevance items are as follows: The use of gamification applications is important in my profession. (Mixed group $M=3.68$, $SD=1.22$, Online group $M=3.30$, $SD=1.43$); My profession is related to the use of gamification applications. (Mixed group $M=3.40$, $SD=1.29$, Online group $M=3.17$, $SD=1.37$); In my profession, the use of gamification applications is a must. (Mixed group $M=2.68$, $SD=1.28$, Online group $M=2.13$, $SD=1.46$).

When the items related to the Output Quality were examined, it was determined that the materials used in the field of gamification were of high quality, the learning outcomes were of high quality and the targeted learning results could be reached more easily by using gamification applications. Mean and standard deviation values given by the mixed and online group parents to the Output Quality related items are as follows: I think the quality of the materials in using gamification applications is high. (Mixed group $M=4.04$, $SD=0.84$, Online group $M=4.74$, $SD=.54$); I think that learning outcomes have high quality when using gamification applications. (Mixed group $M=4.36$, $SD=0.86$, Online group $M=4.78$, $SD=.52$); I think that by using gamification applications, targeted learning outcomes can be achieved more easily. (Mixed group $M=4.44$, $SD=0.51$, Online group $M=4.78$, $SD=.52$).

When the items related to the Result Demonstrability were examined, it was determined that the parents could easily explain the results of the use of gamification applications to others, the results could be easily discussed with other parents, the results of the use of gamification applications were understandable and they could discuss whether the gamification applications were beneficial. Mean and standard deviation values given by parents to the Result Demonstrability related items are as follows: I can easily explain the consequences of using gamification applications to others. (Mixed group $M=4.52$, $SD=0.71$, Online group $M=4.96$, $SD=.21$); I can easily discuss the consequences of using gamification applications with others. (Mixed group $M=4.52$, $SD=0.65$, Online group $M=4.87$, $SD=.34$); The consequences of using gamification applications are understandable to me. (Mixed group $M=4.68$, $SD=0.48$, Online group $M=4.87$, $SD=.46$); I can discuss with others whether the use of gamification applications is useful or not. (Mixed group $M=4.60$, $SD=0.65$, Online group $M=4.83$, $SD=.39$).

When the items related to the Subjective Norm were examined, it was found that people who are important to parents were not influential in terms of using gamification practices. Mean and standard deviation values given by the parents

to Subjective Norm related items are as follows: People who influence my behavior think that I should use gamification applications. (Mixed group $M=2.64$, $SD=1.11$, Online group $M=2.09$, $SD=.90$); People who are important to me state that I need to use gamification applications. (Mixed group $M=3.00$, $SD=1.26$, Online group $M=2.04$, $SD=.88$); I think using gamification applications will increase my value in the eyes of other people. (Mixed group $M=3.48$, $SD=1.33$, Online group $M=3.57$, $SD=.95$).

When the items related to Perceived Usefulness were examined, it was revealed that the use of gamification applications increases the performance of the parents, increases the productivity of the parents, and the use of gamification applications is beneficial for the parents. Mean and standard deviation values given by the parents to Perceived Usefulness related items are as follows: The use of gamification applications improves parenting performance. (Mixed group $M=4.48$, $SD=0.65$, Online group $M=4.87$, $SD=.34$); The use of gamification applications increases my parenting productivity. (Mixed group $M=4.40$, $SD=0.96$, Online group $M=4.91$, $SD=.29$); The use of gamification applications increases my effectiveness in parenting. (Mixed group $M=4.60$, $SD=0.65$, Online group $M=4.87$, $SD=.34$); The use of gamification applications is useful for parents. (Mixed group $M=4.52$, $SD=0.59$, Online group $M=4.91$, $SD=.29$).

When the items related to the Perceived Ease of Use were examined, it has been determined that gamification applications are easy to use, understandable and problem-free Mean and standard deviation values given by the parents to the Perceived Ease of Use related items are as follows: Gamification applications are easy to use. (Mixed group $M=4.44$, $SD=0.71$, Online group $M=4.57$, $SD=.66$); I don't have to use a lot of effort in using gamification applications. (Mixed group $M=3.84$, $SD=0.80$, Online group $M=2.09$, $SD=.60$); Gamification applications are understandable and trouble-free. (Mixed group $M=4.12$, $SD=0.73$, Online group $M=4.57$, $SD=.59$);

When the items related to the Intention to Use were examined, it was determined that they will use gamification applications in the future, participate in various training to learn and conduct more research. Mean and standard deviation values given by the parents are as follows: I will use gamification applications in the future. (Mixed group $M=4.72$, $SD=0.46$, Online group $M=4.30$, $SD=.56$); I will participate in various training to learn gamification applications. (Mixed group $M=4.36$, $SD=0.64$, Online group $M=4.30$, $SD=.56$); I will investigate more to learn gamification applications. (Mixed group $M=4.60$, $SD=0.50$, Online group $M=4.43$, $SD=.51$). These results show that the use of gamification applications increases parenting performance, productivity, and effectiveness, that parents will use gamification applications in the future and that they can easily explain the results of the use of gamification applications to others. It shows that parents are not obliged to use gamification in their occupations and that people who influence their behaviors do not think that they should use gamification applications.

3.2 Comparison of Means of the Groups in Technology Acceptance Results for Gamification Applications

Table 4 shows a comparison of the means of the two groups.

Table 4. Comparison of the mean of the groups

	Mean	N	SS	t	df	p	Explanation
Mixed Group	4.55	25	0.42	0.278	46	0.783	p>0.05 The difference is meaningless
Online Group	4.52	23	0.25				

Parents' views on gamification applications were quite positive in both groups. The mixed group (M = 4.55) and the online group (M = 4.52) scored an average of "Very good" on technology acceptance for gamification applications. When evaluating the environment in terms of different variables in the two groups, no significant difference was found between the evaluation results of the two groups (p = .783, p > 0.05).

4 Conclusions

According to these results, it has been determined that parents who use gamification applications have higher prestige than those who do not use these applications and that using them is an indicator of status in parenting. It was determined that the parents found the materials to be of high quality in the gamification applications, they found the learning outcomes to be of high quality and they could reach the targeted learning outcomes more easily. It was determined that they could easily explain the results of the use of gamification applications, discuss them with others, and the results were understandable. Parents can also discuss whether gamification applications are useful to others. Parents think that by using gamification applications, their value in the eyes of other people will increase. Gamification increases parents' performance, productivity, and effectiveness. The use of these applications is beneficial for parents. The applications were found to be easy to use. It has been revealed that parents use little effort when using the apps. Gameplay applications are understandable and trouble-free. It was determined that the parents would use gamification applications in the future, they would try in combination with classical teaching methods and they would learn and research in order to increase their knowledge. It was determined that gamification applications are not compulsory in the professions in which the parents work. People who influence the parents' behavior and who are important to them do not advise that they should use gamification applications. Future studies will provide training on how parents can use their gamification applications for their children's education within the framework of the Technology Acceptance Model 2.

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