Investigating Pre-Service Teachers' Behavioral Intentions to Use Web 2.0 Gamification Tools

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This study aimed to investigate the pre-service teachers' behavioural intentions about using gamification tools and the critical factors affecting their usage. The data were collected from 313 pre-service teachers from two large-scale universities in Turkey through a questionnaire with seven constructs: perceived ease of use, usefulness, self-efficacy, enjoyment, computer anxiety, attitude, and behavioural intention. Firstly, students were trained on the gamification method and Web 2.0 gamification tools (Kahoot!, Classdojo, and Jeopardylabs), then data were collected through a questionnaire. This study used the Technology Acceptance Model as a research framework. The data were analyzed by Structural Equation Modeling. The results showed that perceived self-efficacy and attitude factors had significant direct effects on pre-service teachers' behavioural intentions to use gamification tools. Furthermore, the perceived enjoyment and usefulness factors significantly affected pre-service teachers' attitudes towards using gamification tools. Additionally, the perceived self-efficacy and attitude factors had significant direct effects on perceived enjoyment to use gamification tools. Moreover, indirect effects on the dependent variables were revealed. Eventually, six constructs accounted for 75% of the variance for intention to use gamification tools. As a result, the research model appeared to have a good fit. Based on the findings within the scope of this study, various suggestions for researchers and practitioners were presented.

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Introduction

Gamification has become a popular topic in education by increasing attention and including the students in learning processes. Gamification motivates the learners to expand their learning performance, improves their problem-solving skills, helps them gain social and cognitive skills, and get engaged (Başal & Kaynak, 2020; Martí-Parreño et al., 2021). Gamification is a method in which game design elements are used in non-game contexts and shaped in digital and non-digital environments (Martí-Parreño et al., 2021). Interactive and fun learning environments can be created using gamification tools in the classes. Since teachers are an essential part of the teaching-learning process, they have a crucial role in presenting the pedagogical, especially technology-related innovations, in-class environment (Kimmons et al., 2017; Parkman, Litz & Gromik, 2018; Teo, 2012).

The new generation of learners wants to experience education in several different learning environments (Colling et al., 2022; Pfost & Artelt, 2018; Schaltz & Klapproth, 2014). Moreover, when it is considered that every individual has a different learning style, game-based learning environments and tools offer them an entertaining and motivating learning environment (O'Connor & Menaker, 2008). For this reason, educational institutions that train teachers should increase such use of these technologies, and the pre-service teachers should be allowed to get used to these tools, and learning experience should be provided in these environments (Bingimlas, 2009; Elmas & Geban, 2012). Otherwise, the pre-service teachers who have no specialization in instructional technologies can mislead their colleagues and misinterpret the education technology-based applications (Newland & Byles, 2014).

The abrupt changes caused by the pandemic have significantly affected students at all educational levels. Under these circumstances, educators have been focused on developing the best educational environments for meaningful learning using new technological tools and methods (Daniel, 2020). Therefore, during the Covid-19 pandemic period, it was better understood that the gamification method could increase students' interest and interaction towards the lesson (Fontana, 2020; Rincon-Flores & Santos-Guevara, 2021). For this reason, it is crucial to train pre-service teachers to gain competencies to use new methods and instructional technologies in their future careers (Liu 2012; Teo, 2012; Tondeur et al., 2012). Nevertheless, to the best of our knowledge, no previous research has focused on determining the critical factors that affect pre-service teachers' intentions of using Web 2.0 gamification tools.

For this reason, this study aims to reveal the main elements that encourage pre-service teachers to use Web 2.0 gamification tools. When the literature is analyzed, it is observed that there are only a few studies that focus on this subject despite the increase in academic interests in gamification. Studies in the literature have also suggested that it is crucial to understand the barriers to acceptance to support the inclusion of digital game tools in educational environments (Biesta et al., 2015; Kaimara et al., 2021; Sánchez-Mena & Martí-Parreño, 2017). Research on creating technology-supported learning environments has emphasized that the critical element of successfully integrating technology into educational settings is the acceptance of technology by teachers and students (Venkatesh & Bala, 2008; Zacharis, 2012). The key factors behind the teachers' decision to include technology in the teaching-learning process are the perception that the technology to be used will have a positive impact on learners, contribute significantly to learning, and not impose an extra workload on themselves (Mac Callum et al., 2014; Thorsteinsson & Niculescu, 2013). Therefore, pre-service teachers' assessment of the perceived usefulness of technology is one of the main determinants of its future use (Gerow et al., 2013). Many researchers have

successfully used Technology Acceptance Model (TAM) to predict behavioural intention towards digital technologies, and it has become a practical theory (Chen et al., 2009; Nair & Das, 2012). In this study, TAM is used to determine the factors affecting pre-service teachers' intention to use Web 2.0 gamification tools and the decisions taken in this process.

Dele-Ajayi et al. (2017) have been used TAM to determine teachers' attitudes towards using digital educational game tools in their classrooms. Accordingly, it was found that TAM is an effective theoretical structure to explore teachers' attitudes towards their use of digital games for educational purposes, and various suggestions have been made to ensure that teachers are ready to accept this technology. In addition, Bourgonjon et al. (2013) used the TAM model to investigate teachers' game acceptance levels and revealed that this approach is useful in determining teachers' game use intentions. However, researchers also stated a need for further research in various settings and with different teacher groups.

Teachers have an essential role in the integration of technology into educational environments. For this reason, the factors affecting teachers' intention to use technology are examined by researchers. Since teachers are an essential part of the teaching-learning process (Biesta et al., 2015), they have a crucial role in the presentation of the pedagogical, especially technology-related innovations, in-class environments (Kimmons et al., 2017; Parkman et al., 2018; Mumtaz, 2000; Thorsteinsson & Niculescu, 2013). Some studies recommended that teachers should be trained about using instructional technologies in learning environments (Alabbasi, 2018; Bingimlas, 2009; Bourgonjon et al., 2013; Dele-Ajayi et al., 2017; Elmas & Geban, 2012; Saleem et al., 2021). Pektas and Kepceoglu (2019) examined the pre-service teachers' opinions after a four-week gamification implementation. They determined that the pre-service teachers had very positive views on integrating gamification tools into the courses.

Current Study

This study reveals the main elements that encourage pre-service teachers to use Web 2.0 game tools. Additionally, it is expected that this study will be important in filling the gap in the literature by researching the factors that affect the use of Web 2.0 game tools by pre-service teachers. This study will provide a widened conceptual model created about Web 2.0 game tools. Also, it will help determine the factors that affect Web 2.0 game tools for educational institutions that want to integrate this technology into their systems. Educators, course designers, curriculum developers, and technology specialists can produce better materials by considering these factors.

Theoretical Background

TAM is one of the fundamental models that focus on psychological factors to explain technology acceptance of new instructional technologies. This model has a vital role in determining users' behaviours of several computer technologies (Scherer et al., 2019; Teo, 2012). TAM, developed by Davis (1989), is used to determine the factors that affect technology usage and the decisions taken during this process. At the same time, TAM is one of the most frequently used models for studies about adopting new educational technologies (Chintalapati & Daruri, 2017; Huang, Teo & Zhou, 2019).

TAM is used in this study to determine the factors that affect the usage intentions by pre-service teachers for Web 2.0 gamification tools and the decisions made during this process. It is assumed that in TAM, perceived usefulness and ease of use are the critical factors in the

behavioural usage intentions of the users during the process of adopting new technology (Marangunić & Granić, 2015). In TAM, while adopting new technology, perceived usefulness means the individual's level of trust in increasing performance by using the new method. Perceived ease of use means the individual's perception about using the new method with less effort (Davis, 1989).

Research Model and Hypotheses

This study aims to create a model based on TAM theory to explain the factors that affect the pre-service teachers' intentions of using Web 2.0 gamification tools in classes and gain a broader point of view. The proposed model for determining the pre-service teachers' intentions of using Web 2.0 gamification tools in classes is given in Figure 1.
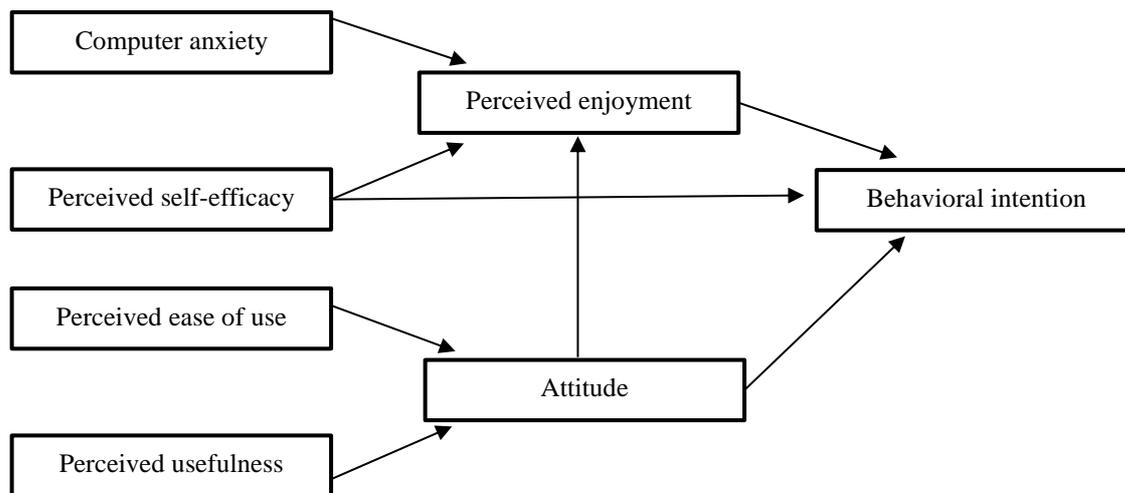
Figure 1. Research model.

Perceived ease of use

Perceived ease of use is defined as how an individual believes using a particular system is purified from excess physical and mental effort (Davis, 1989). The studies in the literature reveal that the beliefs of users about the easy use of a particular technology affect their behaviours and attitudes that play a role in adopting and using that technology (Alharbi & Drew, 2014; Hsu & Lu, 2007; Kang & Shin, 2015; Okazaki & Renda Dos Santos, 2012; Yang et al., 2017; Yang &Wang, 2019). Sadaf et al. (2016) stated that the perceived ease of use factor in pre-service teachers' attitudes towards using Web 2.0 tools positively affects their perceived usefulness and intention to adopt them. Regarding this study, it can be stated that if pre-service teachers find Web 2.0 gamification tools easy to use, they will most probably adopt these tools and continue to use them further. Correspondingly, the below hypothesis is proposed:

H1. Perceived ease of use significantly influences attitude towards using gamification tools.

Perceived usefulness

Perceived usefulness stands for the degree to which individuals believe using a particular system increases their job performance (Davis, Bagozzi & Warshaw, 1989). In this context, it can be stated that the tendencies of individuals for using the applications will be more if they believe that the applications will increase their performance. Therefore,

perceived usefulness is one of the most critical factors that affect users' intentions during the technology adoption process (Alharbi & Drew, 2014; Yang & Wang, 2019). Furthermore, perceived usefulness positively impacts gamification tools (Hsu & Lu, 2007; Lee et al., 2012; Leng & Lada, 2011; Wong, 2016; Yoo et al., 2017). For this reason, pre-service teachers' intentions while using Web 2.0 gamification tools will be increased as these applications increase interaction, provide more control on the learning process and help save time. Correspondingly, the below hypothesis is proposed:

H2. Perceived usefulness has a significant influence on attitude towards using gamification tools.

Perceived self-efficacy

Computer self-efficacy is defined as the computer-using skills of individuals or individuals' perceptions on the computer that they can use to complete tasks on the computer. Computer self-efficacy affects how individuals shape their perceived usefulness attitudes and intentions to use the new technology (Al-Haderi, 2013; Compeau & Higgins, 1995). Having a favourable judgment about the skills of the individuals affects the way of adoption of technological tools used in education (Compeau & Higgins, 1995). The teachers who have high levels of self-efficacy about using gamification tools can use these applications by relating them to existing teaching methods (Chung & Tan, 2004; Joo et al., 2016; Wang & Wang, 2008). A study made by Zhang and Liu (2019) analyzes the relationships between motivational regulation, online professional learning communities, and learning engagements. It is seen that the teachers with higher levels of self-efficacy have better skills of motivational regulation. Therefore, it is recommended that the teachers develop their perceived self-efficacy to increase their learning participation in online professional learning communities. Besides, Bandura (1986) states that self-efficacy motivates the individual and takes action. Adukaite et al. (2017) state that lack of self-efficacy results in lower levels of satisfaction and enjoyment and negatively affects the individual's adoption of new technologies. For this reason, it is expected that pre-service teachers with high computer self-efficacy will find Web 2.0 gamification tools more acceptable and enjoyable. Correspondingly, the below hypotheses are proposed:

H3a: Perceived self-efficacy has a significant influence on behavioural intention to use gamification tools.

H3b: Perceived self-efficacy has a significant influence on perceived enjoyment to use gamification tools.

Computer anxiety

Computer anxiety is the fear and concern that an individual feels when facing the probability of using the computer (Leso & Peck, 1992). The literature studies state that individuals who have the skills and experience of using computers have lower levels of technology anxiety (Ekizoglu & Ozcinar, 2010). On the other hand, high levels of computer anxiety result in an unwillingness to use and gain new technology and internet skills (Chaffin & Harlow, 2005; Jung et al., 2010). Additively, it can be stated that computer anxiety has an important effect on the willingness of pre-service teachers to use technology (Joo et al., 2016). Thus, Joo et al. (2016) state that technology anxiety will stress individuals. This situation will prevent the individual from entering the playful state while using technology and harm intrinsic motivation. Therefore, pre-service teachers with high computer anxiety experience stress about using Web 2.0 gamification tools as new technology and their

intrinsic motivations and perceived enjoyment may be negatively affected. Correspondingly, the below hypothesis is proposed:

H4: Pre-service teachers' computer anxiety has a significant influence on perceived enjoyment to use gamification tools.

Perceived enjoyment

Perceived enjoyment is the degree to which information technology is perceived as joy (Davis et al., 1992; Venkatesh, 2000). Within the scope of TAM, Davis et al. (1992) state that perceived enjoyment is similar to intrinsic motivation that directs the performance of an activity that is not related to the implementation process of the activity. El Shamy and Hassanein (2017) state that perceived enjoyment has a crucial role in using innovative technologies such as virtual reality devices, wearable devices, and robots. Perceived enjoyment is the dominant variable behind the frequent use of online games (Choi & Kim, 2004). According to Heijden (2003), perceived enjoyment seriously affects usage intentions in the TAM model. Thus, if a user enjoys a new technology, it can be stated that this user will show positive signs of adapting to the particular technology (Al-Adwan et al., 2018; Suki & Suki, 2011). It is seen in the studies in the literature that perceived enjoyment has an important effect on technology usage (Al-Adwan et al., 2018; Cheema et al., 2013; Cheng, 2014; Poong et al., 2017). For this reason, pre-service teachers who have high perceived enjoyment to use Web 2.0 gamification tools may be more inclined to use these tools. Correspondingly, the below hypothesis is proposed:

H5: Perceived enjoyment has a significant influence on pre-service teachers' intention to use gamification tools.

Attitude towards using gamification technologies

Attitude is the overall assessment, both positive and negative, towards the use of systems and applications (Ajzen, 1991; Fishbein & Ajzen, 1975). Applying the technology in a learning environment mostly depends on the potential users' attitudes (Zain et al., 2005). Perceived enjoyment is taken as an important factor that affects the attitudes of individuals in terms of using a particular system (Moon & Kim, 2001). Hsu and Lu (2007) reveal that the level of enjoyment of the users while playing online games is highly correlated with the positive attitude of the users about games. Besides, it is proved by several studies that there is a strong correlation between attitude and behavioural intentions (Asiri, 2019; Bock et al., 2005). Kao and Tsai (2009) find out that teachers' intentions of using technology are significantly affected by their positive and negative attitudes. Hamari and Koivisto (2013) state that a user's attitude towards the use of gamification technologies has a significant impact on adapting to the games and their intentions of using the games further. In general, the positive attitudes of the users affect their adoption and usage intentions (Abdel-Maksoud, 2018; Asiri, 2019). Therefore, if pre-service teachers have a positive attitude towards Web 2.0 gamification tools, they will be more motivated and enjoy using them. Correspondingly, the below hypotheses are proposed:

H6a: Pre-service teachers' attitudes toward gamification tools will influence their behavioural intentions to use them in their teaching.

H6b: Pre-service teachers' attitudes toward gamification tools will influence their perceived enjoyment to use them.

Method

In this study, the Structural Equation Modeling (SEM) approach is used to investigate factors that predict pre-service teachers' behavioural intentions to use Web 2.0 gamification tools in their future classrooms. The data were collected through a survey and included questions for each factor in the research model.

Participants

Pre-service teachers enrolled in the Instructional Technologies course at two universities participated in this study. The sophomore pre-service teachers were from six different fields. The 313 pre-service teachers (89 males, 224 females; 18-22 ages) filled the survey in the Instructional Technologies course as part of the course evaluation procedure; completing the surveys was voluntary.

Instructional Technologies course includes educational Web 2.0 tools. The pre-service teachers learn to use these tools. Within the scope of the study, a course plan was developed by the researchers to teach pre-service teachers Web 2.0 gamification tools. Two instructors have conducted course sessions in six different fields. The course took four hours in each session. First, the gamification method was presented using a presentation and discussed how using in educational settings. Then, Kahoot!, Classdojo, and Jeopardylabs Web 2.0 gamification tools were shown step-by-step. Finally, the pre-service teachers chose a topic from their fields and designed a gamification based course using Kahoot! tool. Thus, they experienced using Web 2.0 gamification tools. At the end of the course, they filled out the survey. The details of the sample are presented in Table 1.

Table 1. Descriptive statistics of participants

University	Field	Male	Female	Total
University A	Elementary education	24	61	85
	Psychological counseling and guidance	12	21	33
University B	Science education	11	72	83
	Turkish language education	16	29	45
	Special education	15	13	28
	Math education	11	28	39
	Total	89	224	313

Measurement Instrument

The survey was developed based on the literature by the researchers. Also, two experts in the Instructional Technology field have been checked the survey items. The survey included 27 five-point Likert questions in seven dimensions. The dimensions were; self-efficacy, enjoyment, computer anxiety, attitude, ease of use, perceived usefulness, and behavioural intention. The Cronbach's alpha values were calculated to ensure the reliability of each dimension. Table 2 presents the dimensions, number of items implemented, sources, and Cronbach's alpha values were calculated as high in this study.

Table 2. List of Measurement Dimensions and Items

Construct	Items	Sources	Cronbach's alpha
Perceived self-efficacy	I have the necessary skills and knowledge to use gamification tools (Kahoot!, Classdojo, Jeopardylabs, e.g.). I felt confident about using gamification tools (Kahoot!, Classdojo, Jeopardylabs, e.g.). I felt confident about using gamification tools even if nobody was around to show me how to use them.	• Compeau and Higgins (1995) • Lai and Chen (2011)	.88
Perceived enjoyment	I find using gamification tools enjoyable. I have fun using gamification tools. I find using gamification tools pleasant.	• Davis et. al. (1992) • Wang and Wang (2008) • Padilla-Melendez et al. (2013)	.94
Computer anxiety	Computers do not scare me at all. Working with computers makes me nervous. Computers make me feel uncomfortable. Computers are somewhat intimidating to me.	• Wang & Wang (2008)	.81
Perceived usefulness	I believe that using gamification tools will improve my performance as a teacher in my courses in the future. I believe that using gamification tools is useful in my courses. I believe that using gamification tools in my courses makes my students' learning easier. I believe that using gamification tools in my courses increase my students' satisfaction with the course. I believe that using gamification tools in my courses increase my students' grades.	• Davis (1989) • Sadaf et al. (2016)	.92
Perceived ease of use	In general, gamification tools are easy to use. Learning how to use gamification tools is easy for me. Using gamification tools is clear and understandable. It is easy for me to become a skilful teacher using gamification tools.	• Davis (1989)	.90
Attitude	Gamification tools will be useful in my teaching. Using gamification tools is a good idea. Gamification tools will make my courses more interesting. Working with gamification tools is fun. I look forward to using gamification tools in my job.	• Sadaf et al. (2016) • Teo (2009)	.90
Behavioural intention	I predict I will use gamification tools in my courses in the future. I intend to use gamification tools in my courses in the future. I plan to use gamification tools in my courses in the future.	• Venkatesh et al. (2003)	.95

Data Analysis

For SEM analysis, the following assumptions were checked; extreme values, missing data, normality, multicollinearity, and variances of the variables. There was no missing data. Outliers were determined, and eight extreme values were excluded from the data set of 321 (n=313). Skewness and kurtosis values were checked, and each variable was approximately normally distributed. All relationships among the variables were sufficiently linear. Tolerance and Variance Inflation Factor (VIF) values were calculated for multicollinearity. VIF should be less than ten, and tolerance should be above 0.2 (Field, 2013). VIF values were well below ten and the tolerance statistics above 0.2; therefore, there was no collinearity within the data. Thus, the data met all of the assumptions for the SEM. SPSS 24.0 and AMOS 24.0 software were used to conduct analyses.

Findings

Descriptive Statistics and Correlations Among the Variables

The descriptive statistics are presented in Table 3. The highest mean is perceived usefulness (M=4.45), and the lowest mean is computer anxiety (M=1.94). Standard deviations ranged from .678 to .865. The skewness and kurtosis values are less than |3| and |10|, respectively. The data met assumptions of normality for SEM (Kline, 2011). Pearson's correlation test was performed to identify the correlations between the dependent variables. The correlations among all the variables were significant ($p < .01$) (Table 3).

Table 3. Correlation Coefficients and Descriptive Statistics

Measurement variable	Correlations of the measurement variables						
	1	2	3	4	5	6	7
1. Perceived self-efficacy	1						
2. Perceived enjoyment	.456*	1					
3. Computer anxiety	-.412*	-.244*	1				
4. Perceived usefulness	.310*	.563*	-.267*	1			
5. Perceived ease of use	.597*	.457*	-.397*	.514*	1		
6. Attitude	.358*	.607*	-.251*	.813*	.583*	1	
7. Behavioral intention	.400*	.508*	-.234*	.746*	.561*	.860*	1
Mean	3.64	4.23	1.94	4.45	4.00	4.34	4.26
Standard Deviations	.856	.865	.850	.684	.775	.678	.777
Skewness	-.256	-1.21	.617	-1.41	-.549	-.935	-.839
Kurtosis	-.282	1.11	-.509	1.94	-.137	.242	-.041

* p< .01

Assessment of Measurement Model

Based on the result of maximum likelihood estimation, Table 4 shows the goodness of fit indices for the research model. χ2 statistic, the goodness-of-fit index (GFI), the root mean square error of approximation (RMSEA), the adjusted goodness-of-fit (AGFI), and the comparative fit index (CFI) values are presented in Table 4. All values satisfied the recommended levels of fit (Baumgartner & Homburg, 1996; Hoyle, 1995; Klem, 2000; Kline, 2011).

Table 4. Fit Indices for the Research Model

Model fit indices	Values	Perfect	Acceptable	Fit
χ^2/df	2.67	$0 \leq \chi^2/df \leq 2$	$2 \leq \chi^2/df \leq 3$	Acceptable
GFI	.98	$.95 \leq GFI \leq 1.00$		Perfect
RMSEA	.07	$.00 \leq RMSEA \leq .05$	$.05 \leq RMSEA \leq .08$	Acceptable
AGFI	.94	$.90 \leq AGFI \leq 1.00$		Perfect
CFI	.99	$.95 \leq CFI \leq 1.00$		Perfect

Hypothesis Testing

Table 5 presents the analysis of the proposed relationships, and Figure 2 shows the resulting path coefficients of the research model based on standardized estimates. Again, the structural model provided a good fit to the data; six of the eight hypotheses were supported by the data.

Table 5. Hypothesis Testing Results

Hypotheses	Paths	Path Coefficients	p	Results
H1	PEOU → ATU	.224	.000	**Supported**
H2	PU → ATU	.698	.000	**Supported**
H3a	PSE→BI	.125	.000	**Supported**
H3b	PSE → PENJ	.272	.000	**Supported**
H4	CA →PENJ	-.004	.928	Unsupported
H5	PENJ→BI	-.070	.061	Unsupported
H6a	ATU → BI	.858	.000	**Supported**
H6b	ATU → PENJ	.509	.000	**Supported**
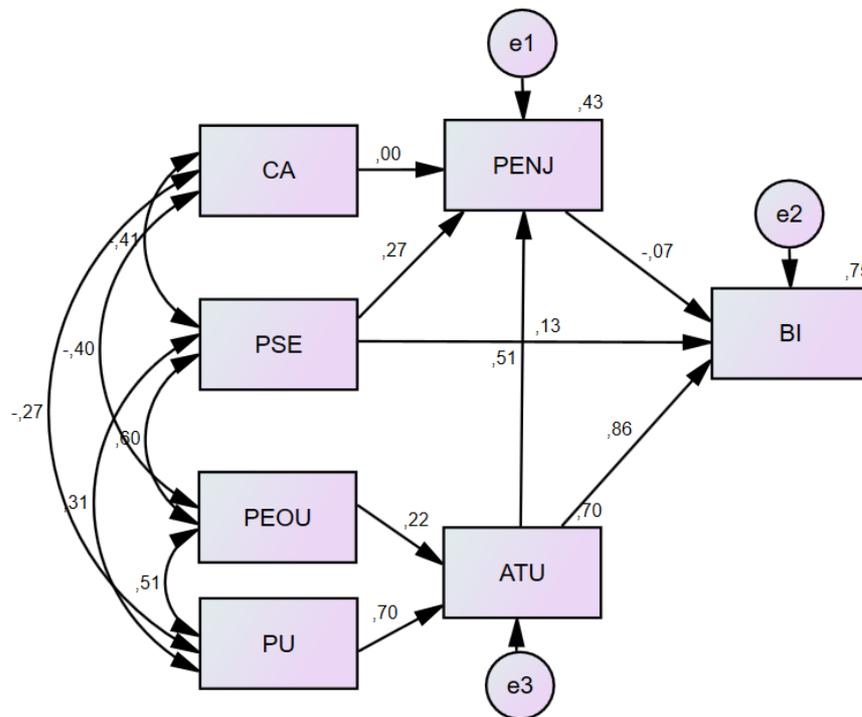
Figure 2. Hypothesized research model.

Based on the analysis of path coefficients, self-efficacy, attitude, perceived usefulness, ease of use, and enjoyment explained 75% of the variance in behavioural intention. Their

determinants explained attitude and enjoyment in amounts of 70% and 43%, respectively (Table 6).

Table 6 shows the direct and indirect effects and total effects associated with each variable. The sum of the direct and indirect effects indicates the total effect. According to Cohen (1988), the effect size values greater than 0.5 are large, 0.5-0.3 is moderate, 0.3-0.1 is small, and anything smaller than 0.1 is insubstantial. The dominant determinant of behavioural intention was attitude, with a total effect of 0.822. The dominant factor of attitude was perceived usefulness, with a total effect of 0.698. The direct, indirect, and total effect values of the determinants of enjoyment are presented in Table 6.

Table 6. Direct, Indirect and Total Influences in the Model

Variables		Direct Effects	Indirect Effects	Total Effects
Dependent variable Behavioural intention	R^2=.75			
Independent variables				
PSE		.125*	-.019	.106*
ATU		.858*	-.036	.822*
PU		-	.574*	.574*
PEOU		-	.184*	.184*
PENJ		-.070	-	-.070
Dependent variable Attitude	R^2=.70			
Independent Variables				
PU		.698*	-	.698*
PEOU		.224*	-	.224*
Dependent variable Perceived enjoyment	R^2=.43			
Independent variables				
PSE		.272*	-	.272*
ATU		.509*	-	.509*
PU		-	.356*	.356*
PEOU		-	.114*	.114*
CA		-.004	-	-.004

* p< .05

Discussion

In this study, a model is proposed and tested to reveal the factors affecting pre-service teachers' intentions of using Web 2.0 gamification tools and the relationship between these factors. The findings of the study show that the proposed research model is meaningful. The study reveals that perceived ease of use and perceived usefulness are effective on pre-service teachers in terms of developing an attitude towards using gamification tools as also proposed by the TAM model and the studies in the literature (Asiri, 2019; Dele-Ajayi et al., 2017; Hsu & Lu, 2007; Lee et al., 2012; Leng & Lada, 2011; Pektas & Kepceoglu, 2019; Sadaf et al., 2016; Tenório et al., 2020; Wong, 2016; Yoo et al., 2017). In addition to these two factors explaining the attitude by 70%, perceived usefulness has a more significant effect on attitude while perceived ease of use is less. This finding shows that the pre-service teachers will have a positive attitude towards using Web 2.0 gamification tools if they believe that these tools will make the learning process more effective. Thus, it can be stated that being easy to use is more decisive compared to being easy on attitudes. It is revealed that attitude is the most critical factor affecting the intentions of the pre-service teachers to use gamification tools. Studies show a strong correlation between attitude and behavioural intentions (Asiri, 2019; Bock et al., 2005; Kaimara et al., 2021; Sánchez-Mena & Martí-Parreño, 2017).

On the other hand, it is stated that perceived enjoyment has a crucial role in using the new technologies, and if a user enjoys using the latest technology, this user will positively adapt to the technology (Al-Adwan et al., 2018; El Shamy & Hassanein 2017; Suki & Suki, 2011). Yet, contrary to the literature, perceived enjoyment does not affect behavioural intention in this study. This situation can be thought of as a sign that the pre-service teachers focus on the educational side of the Web 2.0 gamification tools. Sadaf et al. (2016) does not discuss perceived enjoyment while explaining the pre-service teachers' intentions to use Web 2.0 tools. Besides, when perceived enjoyment is analyzed separately, it is seen that attitude has a significant impact on enjoyment. It is stated that, during the implementation process of an activity, perceived enjoyment is similar to intrinsic motivation that directs the performance of another activity that is not related in anyways (Davis et al., 1992).

For this reason, perceived enjoyment can be thought of as a factor on its own regardless of behavioural intention. Besides, it is found that perceived self-efficacy has a small effect on perceived enjoyment and behavioural intention. Adukaite et al. (2017) state that lack of self-efficacy and computer anxiety will result in lower levels of satisfaction and enjoyment and negatively affect the individual in adopting new technologies. Contrarily, it is found out that computer anxiety has not affected perceived enjoyment. Furthermore, the descriptive findings of the study show that the participants did not feel any anxiety while using Web 2.0 gamification tools. According to these results, considering that today's pre-service teachers are digital-native (Prensky, 2014), it can be inferred that similar studies may not take computer anxiety as a determinant factor.

Conclusion

The study's findings show that pre-service teachers should focus on developing their perceived usefulness, perceived ease of use, and self-efficacy to have better behavioural intentions of using gamification methods and tools in their future classes. Therefore, teacher training institutions need to focus on the pedagogical sides of Web 2.0 gamification tools. Previous studies also reveal several pedagogical benefits of using gamification methods in learning environments. Helping pre-service teachers learn the strategies of integrating gamification tools into the learning processes by assigning them projects about developing educational applications with such tools can help them build their perceptions towards the usefulness of these tools and perceived ease of self-efficacy. Furthermore, the use of gamification tools and methods in classes by teacher trainers can increase the perceived usefulness of pre-service teachers towards these tools. Therefore, professional development workshops can be designed for teacher trainers to use these innovative methods and technologies in their courses. Besides, it is determined by the study that pre-service teachers' positive attitudes towards gamification methods and tools and their high levels of self-efficacy can result in perceived enjoyment. Even though it is found out by the study that enjoyment does not have any effects on behavioural intention, it can be stated that pre-service teachers' perceived enjoyment of using these tools is vital in creating intrinsic motivation. Thus, pre-service teachers' positive intention towards Web 2.0 gamification tools can increase their behavioural intentions and motivations towards using these tools. On the other hand, in the educational process where gamification tools are used, students' enjoyment will be higher than teachers. For this reason, perceived enjoyment may be examined in students' use of such technologies.

While interpreting the results of this study, it should be considered that there are some limitations as well. First, the study sample is determined with convenience sampling and is

limited to pre-service teachers studying in different departments of two universities. The proposed model can be tested with larger samples for more generalizable results. The implementation duration of the study is limited. Therefore, pre-service teachers' experience in using gamification tools is limited to one week of course hours and the data of the study is collected as self-reported data. In future studies, teacher trainers can design gamification-based courses for a whole semester, and pre-service teachers' experience towards gamification methods and tools can be examined in detail. Mixed-method studies can be made, which will provide richer data by conducting more extended implementations with observations of behaviours of pre-service teachers from different areas and more profound qualitative interviews. After such model studies, the integration issues of pre-service teachers with such technologies in their future classes can be analyzed with follow up studies. In this study, the behavioural intentions of pre-service teachers have been interpreted on a large scale by the proposed factors. Factors of the varying sort can also be added to the model in parallel with the literature to widen the model and better interpret behavioural intention.

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