Interdisciplinary Journal of Virtual Learning in Medical Sciences

Original Article

Acceptance of Gamified Web-Based Education in Mental Illness Courses: A Survey of Medical Students' Perceptions Over 5 Years

Leili Mosalanejad[1], PhD; Mehdi Dastpak[2], PhD; Zahra Karimian[3]*, PhD

[1]*Department of Medical Education, Jahrom University of Medical Sciences, Jahrom, Iran*
[2]*Department of English Language, Jahrom University of Medical Sciences, Jahrom, Iran*
[3]*Department of E-Learning in Medical Sciences, Virtual School, Shiraz University of Medical Sciences, Shiraz, Iran*

ABSTRACT

Background: Gamified learning can make students more focused and can lead to learning at a deeper level. The aim of this study was to investigate the students' perceptions of gamified web-based learning. In this study, we aimed to find out the students' viewpoints about the dimensions of gamification acceptance and their correlation to each other.

Methods: This survey study was conducted in 2022 on 350 students of Public Health, Medicine, and Laboratory Science who had taken three courses in mental health, health psychology, and mental health and addiction, and were taught through gamified learning between late 2017 and 2021. *The Game Acceptance Questionnaire* was used in this study. The questionnaire consisted of 21 questions divided into seven components: *Perceived ease of use*, *Perceived usefulness*, *Perceived enjoyment*, *Perceived control, Concentration, Attitude towards using, and Behavioral intention*. Each component had three questions. The Likert scale was used in this questionnaire, with a range of 5 to 1, where 5 means strongly agree and 1 means strongly disagree. The cut-off point was 3. Content validity and face validity were examined by experts and students. The reliability of the instrument, as measured by Cronbach's alpha, was 0.872. Data were analyzed using IBM SPSS Statistics V22.0.

Results: The highest mean scores were related to attention to play (4.15±0.64), concentration during play (4.03±0.59), attitude towards playing as a good idea (4.025±0.65), ease of learning (3.99±0.70), and interesting gamification (3.96±0.74). Students' perspectives did not differ significantly by the field of study. Differences in the acceptance of gamification components were significant by gender only in the field of enjoyment (P=0.02).

Conclusions: The use of gamification is an emerging technology in many countries, including developing countries, and useful and practical information about it can facilitate its expansion and proper use.

Keywords: Gamified learning, Game acceptance, Gamification, Medical students, Mental health course, Medical education

**Corresponding author:*
Zahra Karimian, PhD;
Department of e-Learning in Medical Sciences, Virtual School and Center of Excellence in e-Learning, Shiraz University of Medical Sciences, Shiraz, Iran
Email: Karimian@sums.ac.ir

Please cite this paper as:
Mosalanejad L, Dastpak M, Karimian Z. Acceptance of Gamified Web-Based Education in Mental Illness Courses: A Survey of Medical Students' Perceptions Over 5 Years. Interdiscip J Virtual Learn Med Sci. 2023;14(3):225-237.doi:10.30476/IJVLMS.2023.99871.1253.

Received: 06-07-2023
Revised: 06-27-2023
Accepted: 07-13-2023

Introduction

The entry into the third millennium has confronted man with challenging phrases such as the century of speed and change, or the age of information and communication. It is an era that is considered as a powerful platform and tool that can have a tremendous economic, social, cultural, and political impact (1). Recently, with the development of e-learning system, the issue of mobile learning has received more serious attention among the managers of educational systems (1, 2). Integration of information and communication technology with the educational process facilitates the communication of learners, accessing a wide range of learning resources, providing an appropriate curriculum to the needs of learners, ensuring equitable opportunities for all learners, and promoting social and cultural communities through wireless Internet access (3, 4).

One of the most important challenges for teachers is to create motivation and active learning in students. Accordingly, teaching and learning methods could be divided into passive and active (5). Game and playing is one of the active educational methods, and it seems that the gamified learning can make students more focused; it also leads to much deeper learning. Research has shown that gamified educational design has a positive effect on improving the knowledge, performance, and attitude of students. Gamified learning, which is also referred to by other words such as gamification (6, 7), serious game, and gamification, means the use of game elements in non-game environments (8). Of course, the specific definition of each of these concepts differs in some applications, but what is commonly used in most of the articles related to the use of games in education is the more common term gamification and includes other meanings as well. The important point is that gamification does not mean making a game with the purpose of entertainment, and basically its main purpose is education and learning, which is done with a gamified educational design approach (8, 9).

The use of emerging methodologies such as digital game and gamification has revealed great potential in improving the teaching and learning processes (10, 11). Proponents of game learning argue that computer games have the potential to change college education, motivate, and engage the new generation, what the traditional education lacks. Gamification can revolutionize college education because it increases the students' motivation and engagement (12). Students' motivation to learn, and ability to learn and play skills can be key factors that affect the acquisition of knowledge through digital gamification (13). In the literature, various elements of the game have been used in education, including points, point, badges, rewards, leaderboard, and feedback (8, 9, 14, 15). Also, more than 108 elements of gamification are known, which can be effective in creating interest and motivation in learning, but three main elements of *Points, Badges* and *Leader* are three common and essential elements in gamified learning (14). In general, gamification and gamified learning is a relatively new approach in e-learning that has increased with the development of new technologies, and some studies have also pointed to the effectiveness of this approach (16-18), but more studies are still needed.

Based on the studies, various models and methods have been used worldwide to examine the factors affecting the adoption of information technology; one of their most authoritative one is the Technology Acceptance Model (TAM), which examines the factors at the individual level. Technology acceptance is a structure that consists of cognitive and psychological elements about the use of technology (19, 20). All these models aim to understand the factors that affect the effective use of technology. Among these models, the TAM is the most popular and widely used one in studies related to computers and Internet technologies (21-23). Designed and developed by Davis (1989), the TAM measures the individuals' willingness and intention to use technology based on three elements: perceived usefulness, perceived ease, and behavioral intent to use (20, 24).

Venkatesh et al. Developed the Integrated Acceptance and Use Model theory. This model incorporates similar elements in eight different models (social cognition theory, innovation diffusion theory, technology acceptance model, planned behavior theory, hybrid technology acceptance model and planned behavior theory, motivational model, personal computer use model, and the theory of rational action which combines "hope for performance, hope for effort, facilitation, and social influence" as the four basic elements that determine behavioral intent for use (25). Given the importance of educational gamification and its importance in student learning, it seems that different models have a role in the adoption of game-based technology in education. Educational computer games are increasingly seen as a promising tool to illuminate the students' learning motivation. They provide a scenario-based learning environment in which users gain knowledge or skills from the game (26). They not only provide a virtual learning space to users, but also enable them to play an active role in learning, which is why they are more effective than traditional educational tools in motivating students to learn (27). In addition, these types of games often require the user to perform a challenging task, so that the users can also develop their problem-solving ability (28, 29) and by mastering the subject of their learning through the process as a strengthened practitioner (30, 31). In addition, users in this case are no longer passive recipients of knowledge from their teachers, but active knowledge makers (32) who, thus, achieve meaningful learning. Hence, educational computer games have attracted the attention of many researchers and have been introduced in many fields. Studies have also shown that educational gamification, when equipped with appropriate learning strategies, will improve the students' learning effectiveness (25, 33). The study by Robson outlines the definition of gamification and suggests an initial framework based on key psychological theories, including the theory of self-determination and intrinsic and extrinsic motivation (34).

One of the courses offered for many medical science disciplines at Jahrom University of Medical Sciences is "Mental Illnesses Courses." This course has been run using a gamification approach and through the Web for students for a period of 5 years. The diverse nature of courses related to psychology and mental health aligns well with the gamification method, and over the course of a long period, many students have received education through this approach. Although theories and past research confirmed the effectiveness of gamification on student learning, due to the novelty of this learning method, it is necessary to further investigate and research the acceptance of this technology-based education. Especially in web-based gamification, students are alone in the learning environment and learn individually, so it is necessary to investigate whether they have a pleasant experience with this type of education and whether this method can meet their learning needs. Therefore, the present study aimed to investigate the acceptance of gamified web-based education in mental illness courses from the medical student's perceptions.

Methods

Design and Setting

This research has been done in 2022 by survey method on students of Jahrom University of Medical Sciences, who used gamified web-based learning in three courses of mental illnesses during the 2017-2021.

Participants

The statistical population of the present study included all students of Public health, Medicine, and Laboratory sciences who in the period of late 2017 to 2021 had taken three courses related to mental illnesses) Mental health, Health psychology and Mental health and addiction) and were taught in a gamified approach.

Sampling

For estimating the required sample size

for this research, the Cochran formula can be used. Given that the number of students who used the web-based gamified learning method between 2017-2021 was 350 (N), with an alpha level of 95%, error level of 0.05, and a Z-value of 1.96, the minimum sample size was estimated to be around 184 students. It is worth noting that in this formula, due to the lack of previous similar research, the values of P and Q were considered 0.5.

$$n = \frac{\frac{z^2 pq}{d^2}}{1 + \frac{1}{N}\left[\frac{z^2 pq}{d^2} - 1\right]}$$

However, since the questionnaire was sent electronically to the students, and the possibility of sample dropout in the electronic method is very high, an email containing a questionnaire link was sent to 250 students, and ultimately, 227 students fully responded to the questions.

Tools/Instruments

At the end of each course, the students were asked to answer an online questionnaire. To conduct the research, we used the TAM Questionnaire used by previous researchers including Liao & Huang (2015) (24), The questionnaire consists of 21 questions in seven components: *Perceived ease* of use, *perceived ease* of use, *perceived usefulness*, *perceived enjoyment, Perceived control, Concentration, Attitude towards using, and Behavioral intention*, with 3 questions in each area. In this questionnaire, a Likert scale from 5=strongly agree to 1=strongly disagree was used, and score greater than 3 meant accepting the desirability of the gamified learning (24, 35). The questionnaires were sent online to the students after the end of the academic term to gather their opinions.

Validity and Reliability: Validity and reliability of the questionnaire have previously been approved by previous studies (24, 36, 37) but because this questionnaire was translated, face validity was examined through the perspectives of 5 students and 10 educational experts in the field of e-learning, medical education and educational management after translating the questionnaire. Grammar problems were corrected. Also, the content validity of the questionnaire was re-examined by the Content Validity Index, for which the views of 10 educational experts were used. In the content validity index, experts were asked to determine the degree of relevance of each item in three areas of relevance, simplicity, and clarity with the four-part spectrum. Finally, the number of experts who chose options 3 and 4 were divided by the total number of experts. If the value was less than 0.70, the item was rejected. If it was between 0.70 and 0.79, a review should have been performed, and if it was greater than 0.79, it was acceptable (38). In reviewing the opinions of 10 experts, except for the three questions, the rest of the questions had an agreement score of more than 85%. Two questions had a lower score than the simplicity index, which were finally approved by more than 0.80 after correction. The reliability of the instrument was confirmed again with 30 samples and 21 questions by internal consistency analysis of questions with Cronbach's alpha 0.87.

Gamification of Content: In total, two gamified courses named mental illness with the link Psychiplay.ir (Figure 1) and addiction with the link Addiplay.ir (Figure 2) were designed. The scientific content of these courses was in the two topics of mental illness and addiction prevention, which were presented in three courses of mental health and addiction, Health psychology, and General psychology for three groups of students majoring in Health, Medicine, and Laboratory Sciences.

Mental illness topics (Psychiplay.ir web-bases gamification) included 13 stages about the signs and symptoms of mental illness and mental disorders. Addiction course topics (Addiplay.ir web-based gamification) also included the type of substance abuse, complication and using, and prevention and treatment. The scientific content of the course was based on the approved curriculum in the field of mental health and addiction prevention. It was developed and endorsed by the psychology and psychiatric nursing department.

Figure 1: View of the first page of gamified web-based training of Psychiplay.ir

Figure 2: View of the first page of gamified web-based training of Addiplay.ir

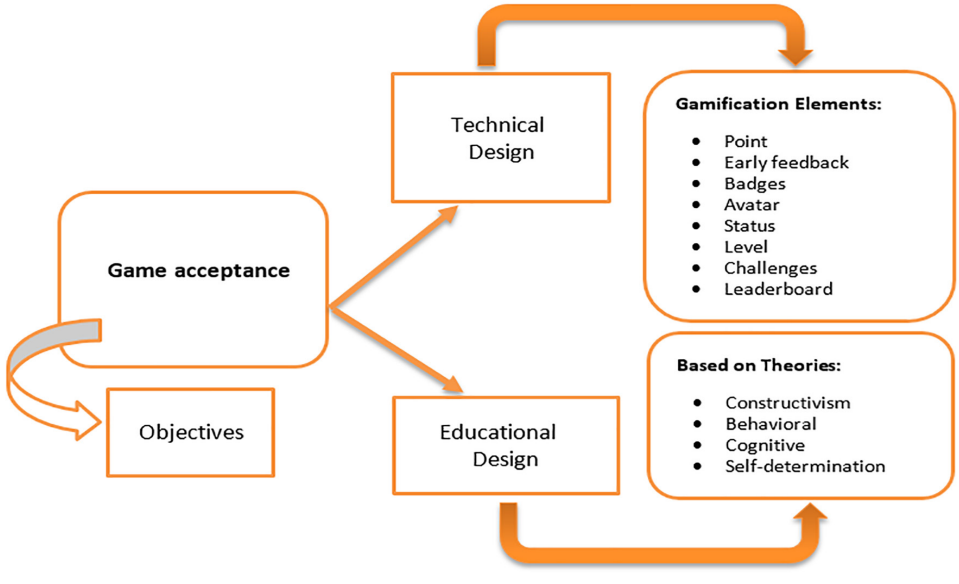

Figure 3: Gamification elements, concept, and process

According to the theories and researches, there are more than 108 elements of gamification known, but *Points*, *Badges*, and *Leaderboards* are considered as the most important elements commonly used in gamification and have been found to be effective in promoting engagement and motivation in learners (14). Finally, the gamified design of both courses was based on web-based questioning, along with elements of Point, Early feedback, Badges, Avatar, Status, Level, Challenges, and Leaderboard.

Figure 3 shows the educational and technical design and elements used in two gamified courses (Figure 3), and Table 1 shows their features (Table 1):

Data Analysis

Data were analyzed by IBM SPSS Statistics V22.0 using one-sample t-test, independent t-test, ANOVA, and Pearson correlation coefficient.

Results

Based on the research findings in the two web-based gamifications, 227 students answered the online questionnaire completely. In total, most of the 97 students (42.7%) were studying medicine, 120 (52.9%) of them were male, and their mean age was about 20.6 years. The demographic characteristics of the students are shown in Table 2.

Acceptance and desirability gamification training: Figure 4 shows that the highest mean is related to the concentration and attitude towards using components, respectively, and the lowest is related to perceived control and perceived enjoyment. Based on the results of one-sample t-test and comparison of mean comments, all components had a score higher than the cut-off-point and in all components P value was <0.001 (Figure 4).

Table 3 shows the average of each item. In the comparison of items, the highest mean was related to attention to play (4.15±0.64), concentration during play (4.03±0.59), attitude to play as a good idea (4.025±0.65), ease of learning (3.99±0.70), and interesting game (3.96±0.74) (Table 3).

Table 1: Titles of three courses about mental illnesses and the participants' groups

Field of Study	Courses	Duration	Number of Population	Number of Samples	Game Title
Medicine	Health psychology	2017-2021	201	97	psychiplay.ir (4 stage) addiplay.ir (4 stage)
Laboratory science	General psychology	2020-2021	84	73	psychiplay.ir (7 stage) addiplay.ir(8 stage)
Public health	Mental health and addiction	2019-2021	65	57	psychiplay.ir (4 stage) addiplay.ir (4 stage)
-		2017-2021	350	227	

Table 2: Demographic characteristics of the participants in the research

Demographic Characteristics		Frequency	Percent
Field of Study	Medicine	97	42.7
	Health	57	25.1
	Laboratory sciences	73	32.2
	Total	227	100.0
Gender	Male	120	52.9
	Female	107	47.1
	Total	227	100.0
Age	Minimum	19	
	Maximum	23	
	Mean±SD	20.6±1.45	

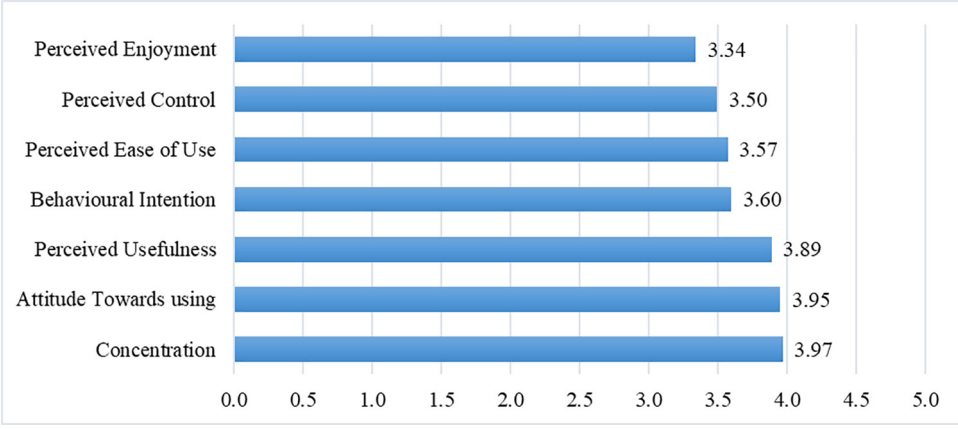

Figure 4: Average components of game acceptance from students' perspectives

Table 3: Average items of gamification acceptance from the students' point of view

Components	Items	Mean	SD
Perceived ease of use	It is easy for me to become skilful at playing the game.	3.44	0.52
	I think that the game is easy to play.	3.29	0.74
	Learning to play the game is easy for me.	3.99	0.70
Perceived usefulness	I think that the game is useful in assisting me with vocabulary learning	3.74	1.10
	I think that the game is useful in assisting me with vocabulary learning in a quick fashion.	3.96	0.95
	I can achieve greater learning effectiveness with the assistance of this game.	3.96	0.89
Perceived enjoyment	I find the game exciting.	3.34	1.30
	I find the game enjoyable.	3.26	1.31
	I find the game interesting.	3.42	1.23
Perceived control	I have full control over the proceeding of the game.	3.46	0.75
	I sense no confusion when playing the game.	3.45	0.82
	I feel no frustration when playing the game.	3.57	0.80
Concentration	I am completely engrossed in the game when playing it.	3.74	0.81
	I pay full attention to the game when playing it.	4.03	0.59
	I concentrate solely on the game when playing it.	4.15	0.64
Attitude towards using	I regard playing the game as a good idea.	4.02	0.65
	I find that the game makes learning more interesting.	3.96	0.74
	I prefer learning English vocabulary by using the game.	3.89	0.92
Behavioural intention	I am willing to play the game frequently.	3.82	0.83
	I am willing to recommend others to play the game.	3.54	1.06
	I am willing to repeatedly playing the game in the future.	3.44	1.00

Acceptance based on the field of study and gender: The investigation of students' perspectives by field of study did not show a significant difference, but the study of differences in the acceptance of gamification components from the students' perspectives by gender was significant only in the field of enjoyment (P=0.02), and no significant difference was observed in other areas (P>0.05). According to the results, the average component of enjoyable play was more in males than females (Table 4)

Correlation between the components of acceptance. There was a correlation between all components of acceptance. The highest correlation was related to Perceived enjoyment and Perceived usefulness (r=0.851), Attitude towards using and Behavioural

Table 4: Mean average of gamification acceptance from the students' perspectives by gender

Components	Gender	N	Mean	SD	P value
Perceived ease of use	Male	119	3.55	0.60	0.51
	Female	106	3.59	0.38	
Perceived usefulness	Male	119	3.89	1.07	0.99
	Female	106	3.89	0.71	
Perceived enjoyment	Male	119	3.52	1.46	0.02
	Female	106	3.13	0.90	
Perceived control	Male	119	3.48	0.65	0.67
	Female	106	3.52	0.41	
Concentration	Male	119	4.01	0.49	0.22
	Female	106	3.93	0.41	
Attitude towards using	Male	119	3.97	0.63	0.72
	Female	106	3.94	0.55	
Behavioural intention	Male	118	3.68	0.86	0.19
	Female	106	3.53	0.85	

Table 5: Correlation between gamification acceptance components

Components	Index	1	2	3	4	5	6	7	Total
1. Perceived ease of use	R	1							
	P value								
2. Perceived usefulness	R	0.588**	1						
	P value	<0.001							
3. Perceived enjoyment	R	0.402**	0.851**	1					
	P value	<0.001	<0.001						
4. Perceived control	R	0.243**	0.280**	0.289**	1				
	P value	<0.001	<0.001	<0.001					
5. Concentration	R	-0.003	0.025	0.030	0.182**	1			
	P value	0.959	0.705	0.651	0.006				
6. Attitude towards using	R	0.081	0.242**	0.280**	0.477**	0.405**	1		
	P value	0.226	<0.001	<0.001	<0.001	<0.001			
7. Behavioural intention	R	0.048	0.170*	0.224**	0.375**	0.423**	0.826**	1	
	P value	0.470	0.011	0.001	<0.001	<0.001	<0.001		
Total	R	0.511**	0.793**	0.801**	0.582**	0.357**	0.693**	0.646**	1
	P value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	

R: Pearson Correlation; *Correlation is significant at the 0.05 level (2-tailed). **Correlation is significant at the 0.01 level (2-tailed).

intention (r=0.826), Perceived ease of use and Perceived usefulness (r=0.588), Attitude towards using and Perceived control (r=0.477), Concentration and Behavioral intention (r=0.423), Attitude towards using and Concentration (r=0.405), and Perceived ease of use and Perceived enjoyment (r=0.402). Comparing the correlation of each component with the total score, the results showed that the highest correlation of the gamification acceptance score was related to Perceived enjoyment (r=0.801), Perceived usefulness (r=0.793), Attitude towards using (r=0.693), Behavioural intention, respectively. (r=0.646) and Perceived control (r=0.582). (Table 5).

Discussion

In the present study, the average components of gamification acceptance, attention to play, focus while playing, tendency to play as a good idea, ease of learning, and interesting game were more than the others. Tao et al. utilized TAM and other theories to create a research model to identify the

factors influencing the students' intention to use career simulation games on an ongoing basis. Their results showed that the students' intention to continue using games is affected by their level of satisfaction and indirectly by its ease of use due to perceived play (38).

In the field of game acceptance, the present questionnaire, ease of use and satisfaction with its implementation was one of the important areas. Sense of control in playing games is one of the components that was addressed in the recent questionnaire and can be considered equivalent to understanding the usefulness. Perceived pleasure and perceived control are widely accepted as indicators of technology acceptance (35, 39, 40). The results of the above research are consistent with the extracted domains in game acceptance.

In some studies, other components have been mentioned. In a way, perceived pleasure is perceived as the extent of the impact of computer activity and control has been considered as a level of personal control over the environment and actions of the person (41). The focus component was one of the most important dimensions with higher averages. Lu, Zhou, & Wang (2009) used the flow of technology and other factors to measure the users' acceptance of instant messaging (42, 43). They found that perceived utility and perceived pleasure affected attitudes toward use, which in turn affected the behavioral intent. In the present study, the two components "Attitude towards using" and "Behavioral intention" had a positive relationship with each other. According to the results, the average component of enjoyable play was more seen in men than women.

The result of this study was confirmed in other studies (44). This study also showed that the use of gamified learning in information security education had increased their motivation in education and their field. Other studies have also confirmed this result (45).

In the present study, the mean of the components such as attention to the game, focus while playing the game, tendency to play as a good idea, ease of learning and the game were more interesting than the others.

Another study was conducted as a meta-analysis of Video Game Acceptance in the field of technology acceptance. The results of this study showed that perceived ease of use (PEOU), perceived usefulness (PU), and perceived enjoyment (PE) were significantly associated with attitude and had the maximum effect on attitude and motivation of individuals and their behavior. The mentioned factors had a high mean in accepting the gamification of the present study. Males enjoyed gamification more than females. Other components in all disciplines and both sexes had a high average (46).

Another study on the components affecting game acceptance for game learning acceptance showed that users' attention and motivation in learning through gaming was related to components of student PU, student satisfaction (SAT), and student habitual (HAB). On the other hand, satisfaction was related with students' PU. In the present study, usefulness was of important components in game acceptance. If we can consider the attitude to the game as a kind of satisfaction, we can consider the satisfaction component of the above-mentioned research in line with the current research (47).

Another study on the acceptance of technology by people using serious games showed that the perceived usefulness of the game and interaction of students were two components of the adoption of technology and learning tools (48). Other studies have found ease of use to be an important factor in accepting playing in teaching and learning. They also recommend using the game to support teaching and learning (49). Some studies have linked game acceptance to other factors such as playfulness and drowning. And this has been associated with a positive perception of the game (perceived playability) and doing it. This game was about acquiring communication skills through play. The above components in the present study also had an effect on game acceptance with the highest average (50).

It can be said that exposure to and immersion in the game helps to acquire skills

and affects learning. Utility, ease of use, and flexible environment are the important factors in using the game and accepting it in learning (51).

The above factors, with emphasize the flexible environment of the game, remind us of its simplicity, ease, and efficiency in accepting it. Game environment design, game manic, dynamics and interaction between the user and the environment, feedback, challenges, and advantages designed in the design can create a flexible and motivational environment, so that the user can use it to experience effective and deep learning.

Another study links people's experience of the game to acceptance and intrinsic motivation to do so. Major factors in acceptance and motivation were introduced in an article named "perceived usefulness of a game as a learning tool, perceived ease of use".

The mentioned cases and components consider the important role of the factors in the acceptance of the game as effective factors. The present study also pointed out the importance of these components with the highest average in game acceptance. Intrinsic motivation moves the person in a purposeful way, and paves the way for its effective use (52).

In the present study, there was a correlation between all game components and the highest correlation between perceived enjoyment and perceived usefulness (r=0.851), attitude towards using and behavioral intention (r=0.826), perceived ease of use and perceived usefulness, respectively. (r=0.588), attitude towards using and perceived control (r=0.477), concentration and behavioral intention (r=0.423), attitude towards using and concentration (r=0.405), and perceived ease of use and perceived enjoyment (r=0.402). Comparing the correlation of each component with the total score showed that the highest correlation of the game acceptance score was related to perceived enjoyment (r=0.801), perceived usefulness (r=0.793), attitude towards using (r=0.693), behavioral intention, respectively. (r=0.646) and perceived control (r=0.582).

In a study that aimed to investigate the relationship between the components of game acceptance and technology acceptance, the results showed that the relationship between the following was positive: Perceived ease-of-use and Attitude toward use, attitude toward use and Perceived usefulness, Attitude toward use and Intention to use, Intention to use & Actual use, Perceived usefulness, Social Influence Personal and Perceived ease-of-use, Enjoyment and Perceived ease-of-use, and Enjoyment and Perceived usefulness.

The relationship of some elements in this research is consistent with the correlations obtained in this realization. However, the component of social influence in the study and questionnaire of the present study was not discussed. However, the effect of the game and individual characteristics on the factors and the average obtained in it was obvious. The focus on the present realization and its relationship with other components in the above research and other studies can be considered with the attention and motivation to use the parallel game. Consistent relationship with other cases also indicates the effect of factors in all studies on game acceptance (53).

Another study showed that the amount of attention paid to serious play was related to the expectation of learning and its manifestation in performance. In the present study, the relationship between Attitude towards using and Behavioral intention was also positive. The more positive the attitude towards the game, the stronger its application in practice. This means that the person will be more willing to use it. The possible consequence will be a more effective effect on performance or learning (54).

Limitation and Suggestion

This research is the result of surveying the opinions of students over a 5-year period and therefore provides reliable results for educational planning. However, this research is based on gamification in an educational environment and was only conducted for courses with common mental health content, so it may have different results in different environments or different

courses. Therefore, it is recommended that this research be conducted in different environments and with different tools.

Conclusion

Based on research findings, web-based gamified learning has been an acceptable method for students' learning. Additionally, the relationship between the questionnaire dimensions and the total score shows that the enjoyable aspect of learning has the highest correlation with the total score. Therefore, it seems that gamified learning with a sense of enjoyment and engaging students can be an effective method of teaching.

Acknowledgments

Thanks to all the students who participated in this study and completed the questionnaires.

Authors' Contribution

LM participated in design and implementation of web-based gamification, design the intervention, data gathering, draft of primary manuscript, and editing final paper. MD participated in draft of primary manuscript and editing final paper. Z K Participated in writing manuscript, research design, data analysis and editing final paper. All authors confirmed final draft.

Conflict of Interest: None declared.

Ethical Issues

Written ethical approval was taken from the Jahrom University of Medical Sciences's local ethics committee (approval number (Ref.No.993925 From National center for strategic Research in medical education) and written informed consent was obtained from all the participants.

Funding

Not applicable

References

1 Horton W. Designing courseware for mobile devices, Mobile learning for expending educational opportunities. In: Tokyo, Japan: Workshop Report. 2005. p. 16–20.
2 Barzegar R, Dehghan Zadeh H, Moghadam Zadeh A. From electronic learning to mobile learning: theoretical principles. Interdiscip J Virtual Learn Med Sci. 2020;3(2):35–41.
3 Zare M, Sarikhani R. Obstacles to Implementation of Mobile Learning in Universities of Medical Sciences. Iran J Med Educ. 2015;15:571–8.
4 Yordanova K. Mobile learning and integration of advanced technologies in education. In: Proceedings of the 2007 international conference on Computer systems and technologies. 2007. p. 1–6.
5 Kooloos JGM, Bergman EM, Scheffers MAGP, Schepens-Franke AN, Vorstenbosch MATM. The effect of passive and active education methods applied in repetition activities on the retention of anatomical knowledge. Anat Sci Educ. 2020;13(4):458–66.
6 Bruder P. Game on: Gamification in the classroom. Educ Dig. 2015;80(7):56.
7 López-Belmonte J, Parra-González M, Segura-Robles A, Pozo-Sánchez S. Scientific mapping of gamification in web of science. Eur J Investig Heal Psychol Educ. 2020;10(3):832–47.
8 van Gaalen AEJ, Brouwer J, Schönrock-Adema J, Bouwkamp-Timmer T, Jaarsma ADC, Georgiadis JR. Gamification of health professions education: a systematic review. Adv Heal Sci Educ. 2021;26(2):683–711.
9 Susi, T., Johannesson, M., & Backlund, P. Serious games—An overview. Technical Report HS- IKI -TR-07-001, School of Humanities and Informatics, University of Skövde, Sweden, 2007;73(10). p 28.
10 Pozo Sánchez S, López Belmonte J, Fuentes Cabrera A, López Núñez JA. Gamification as a methodological complement to flipped learning—an incident factor in learning improvement. Multimodal Technol Interact. 2020;4(2):12.
11 González MEP, Robles AS, Guerrero AJM, López-Belmonte J. Elaboration and validation of the scale to measure the experience on gamification in education

(EGAMEDU). JOTSE. 2022;12(1):217–29.
12 Ripp J, Peccoralo L, Charney D. Attending to the emotional well-being of the health care workforce in a New York City health system during the COVID-19 pandemic. Acad Med. 2020;
13 Moreira MA, González CSG. De la enseñanza con libros de texto al aprendizaje en espacios online gamificados. Educ Siglo XXI. 2015;33(3 Noviembr):15–38.
14 Chou Y. Actionable Gamification: Beyond Points, Badges, and Leaderboards. Scotts Valley, CA: Create space Independent Publishing Platform, Kindle Edition, 2015
15 Teixes F. Yu-Kai Chou (2016). Actionable Gamification: beyond points, badges and leaderboards. Octalysis Media: Fremont. CA. RIO Rev Int Organ. 2017;(18):137–44.
16 Vermeir JF, White MJ, Johnson D, Crombez G, Van Ryckeghem DML. The effects of gamification on computerized cognitive training: systematic review and meta-analysis. JMIR serious games. 2020;8(3):e18644.
17 Kim J, Castelli DM. Effects of gamification on behavioral change in education: A meta-analysis. Int J Environ Res Public Health. 2021;18(7):3550.
18 Liu T, Lipowski M. Sports gamification: Evaluation of its impact on learning motivation and performance in higher education. Int J Environ Res Public Health. 2021;18(3):1267.
19 Yuen AHK, Ma WWK. Gender differences in teacher computer acceptance. J Technol Teach Educ. 2002;10(3):365–82.
20 Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. 1989;319–40.
21 Carlsson C, Carlsson J, Hyvonen K, Puhakainen J, Walden P. Adoption of mobile devices/services-searching for answers with the UTAUT. In: Proceedings of the 39th annual Hawaii international conference on system sciences (HICSS'06). IEEE; 2006. p. 132a-132a.
22 Magsamen-Conrad K, Upadhyaya S, Joa CY, Dowd J. Bridging the divide: Using UTAUT to predict multigenerational tablet adoption practices. Comput Human Behav. 2015;50:186–96.
23 Escobar-Rodríguez T, Carvajal-Trujillo E, Monge-Lozano P. Factors that influence the perceived advantages and relevance of Facebook as a learning tool: An extension of the UTAUT. Australas J Educ Technol. 2014;30(2).
24 Liu C-H, Huang Y-M. An empirical investigation of computer simulation technology acceptance to explore the factors that affect user intention. Univers Access Inf Soc. 2015;14(3):449–57.
25 Venkatesh V, Thong JYL, Xu X. Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Q. 2012;157–78.
26 Hwang G-J, Wu P-H, Chen C-C. An online game approach for improving students' learning performance in web-based problem-solving activities. Comput Educ. 2012;59(4):1246–56.
27 Huang Y-M. Reason and emotion: How they drive students to play a color game. EURASIA J Math Sci Technol Educ. 2018;14(5):1911–24.
28 Huang Y-M, Huang Y-M. A scaffolding strategy to develop handheld sensor-based vocabulary games for improving students' learning motivation and performance. Educ Technol Res Dev. 2015;63(5):691–708.
29 Watson WR, Mong CJ, Harris CA. A case study of the in-class use of a video game for teaching high school history. Comput Educ. 2011;56(2):466–74.
30 Venkatesh V, Morris MG, Davis GB, Davis FD. User acceptance of information technology: Toward a unified view. MIS Q. 2003;425–78.
31 Sung H-Y, Hwang G-J. A collaborative game-based learning approach to improving students' learning performance in science courses. Comput Educ. 2013;63:43–51.
32 Schepers J WMA, Schepers J, Wetzels M. meta-analysis of the technology acceptance model: Investigating subjective norm and moderation effects. Inf Manag.

2007;44(1):90-103.
33 Almulla M. Technology Acceptance Model (Tam) And E-Learning System Use For Education Sustainability. Acad Strateg Manag J. 2021;20(4):1–13.
34 Robson K, Plangger K, Kietzmann JH, McCarthy I, Pitt L. Game on: Engaging customers and employees through gamification. Bus Horiz. 2016;59(1):29–36.
35 Zhou T. The effect of flow experience on user adoption of mobile TV. Behav Inf Technol. 2013;32(3):263–72.
36 Davis FD, Bagozzi RP, Warshaw PR. User acceptance of computer technology: A comparison of two theoretical models. Manage Sci. 1989;35(8):982–1003.
37 Koufaris M. Applying the technology acceptance model and flow theory to online consumer behavior. Inf Syst Res. 2002;13(2):205–23.
38 Waltz C. F., Bausell B. R. Nursing research: design statistics and computer analysis. Davis FA. 1981
39 Tao Y-H, Cheng C-J, Sun S-Y. What influences college students to continue using business simulation games? The Taiwan experience. Comput Educ. 2009;53(3):929–39.
40 Bourgonjon J, Valcke M, Soetaert R, Schellens T. Students' perceptions about the use of video games in the classroom. Comput Educ. 2010;54(4):1145–56.
41 Chen H-R, Lin Y-S. An examination of digital game-based situated learning applied to Chinese language poetry education. Technol Pedagog Educ. 2016;25(2):171–86.
42 Lu Y, Zhou T, Wang B. Exploring Chinese users' acceptance of instant messaging using the theory of planned behavior, the technology acceptance model, and the flow theory. Comput Human Behav. 2009;25(1):29–39.
43 Zhou T, Lu Y, Wang B. Integrating TTF and UTAUT to explain mobile banking user adoption. Comput Human Behav. 2010;26(4):760–7.
44 Jin G, Tu M, Kim T-H, Heffron J, White J. Evaluation of game-based learning in cybersecurity education for high school students. J Educ Learn. 2018;12(1):150–8.
45 Findley MR. The relationship between student learning styles and motivation during educational video game play. Int J Online Pedagog Course Des. 2011;1(3):63–73.
46 Wang X, Goh DH-L. Video game acceptance: A meta-analysis of the extended technology acceptance model. Cyberpsychology, Behav Soc Netw. 2017;20(11):662–71.
47 Rahardja U, Hariguna T, Aini Q. Understanding the impact of determinants in game learning acceptance: An empirical study. Int J Educ Pract. 2019;7(3):136–45.
48 Malaquias RF, Malaquias FFO, Hwang Y. Understanding technology acceptance features in learning through a serious game. Comput Human Behav. 2018;87:395–402.
49 Ishak WHW, Yamin FM. Student acceptance on game to support teaching and learning. Int J. 2020;9(3):2517–21.
50 Tan JL, Goh DH-L, Ang RP, Huan VS. Learning efficacy and user acceptance of a game-based social skills learning environment. Int J child-computer Interact. 2016;9:1–19.
51 Saleh N, Prakash E, Manton R. Factors affecting the acceptance of game-based learning. Int J Comput Appl. 2014;92(13):1–10.
52 Ninaus M, Moeller K, McMullen J, Kiili K. Acceptance of game-based learning and intrinsic motivation as predictors for learning success and flow experience. Int J Serious Games. 2022;4.
53 Ghani MTA, Hamzah M, Ramli S, Ab W, Daud AW, Romli TRM, et al. A questionnaire-based approach on technology acceptance model for mobile digital game-based learning. J Glob Bus Soc Entrep. 2019;5(14):11–21.
54 López FR, Arias-Oliva M, Pelegrín-Borondo J, Marín-Vinuesa LM. Serious games in management education: An acceptance analysis. Int J Manag Educ. 2021;19(3):100517.