

*Original Article*

**Development of gamification as addiction education and examining its effects on students' motivation and enjoyment**

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**Abstract:**

**Introduction** Addiction is a “social disease” which has physical and mental effects. Having adequate knowledge and information about addiction is the best way to prevent it in the community. The current study aims to focus on developing gamification as addiction education and examining its effects on students' motivation and enjoyment. **Methods:** This is guise experiment for gamification development and assess educational intervention. Educational and technical standards have been considered for the development of gamification. In technical standards, it is congruent with the app-making technology based on dynamism, mechanisms and dynamic gamification. This game is available on [www.addisplay.ir](http://www.addisplay.ir) website through Microsoft Aps net core technology. Educational intervention implied on two groups of medical students and Public Health students and learning indicators assessed through intervention. **Results;** The findings of this study on two groups of students showed that, the game can influence on students' enjoyment and consent. In addition, the game had a high average in increasing learners' ability and students satisfaction. One of the limitations of gamification has been its dependence on each learner's ability. **Conclusion:** The results showed that new teaching and learning methods such as gamification in addiction lessons in a mixed and complimentary way can fulfill the educational goals instead of written handbooks or traditional classes and makes learning possible in a motivated and entertaining environment.

**Keywords:** Game; Substance Abuse; application; virtual learning; simulation; Active learning; medical education

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**Introduction:**

Focusing on the effects of addiction and counting them is very important because the negative effects of addiction not only affect the life of the addict, but also ruins the lives of other family members and friends of the addict.

The prevalence of addiction in Iran shows that despite the position of elites in universities, not enough attention has been paid to research on strategic

interventions <sup>1</sup>.

Statistics reveals that the prevalence of drug use in Iran among the age group of 15-64 years is 15.4%. Findings of research on Medical Students of Tehran University of Medical Sciences during the 2009-2010 academic year depicted that the highest rates of addiction belonged to hookah (25.7 %), cigarettes (18 %), alcohol (11.8%) and opium (2.3%).<sup>2,3</sup>

Due to the high prevalence of addiction in Iranian

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society, and the importance of preventing it in the young Iranian society as the productive part of it, appropriate teaching for policy makers and all those involved in this process becomes necessary and efforts to prevent addiction in society become highly crucial.

Each and every individual should be aware of drug abuse and the effects it may have on the physical, mental and social health of themselves and their families<sup>4</sup>. The hygiene and mental health of students as the elite of society have always been the main concern of strategists and policy makers<sup>5</sup>

One of the effective factors on materializing addiction prevention in society is deep and correct teaching about addiction by policy makers and all people involved in society's health.

Improving the quality of the teachings and observing the educational and research standards by all countries across the world, especially by those which has been pioneers of higher education in the last 50 years, have been highly regarded<sup>1)</sup>.

With the advancement of technology and the increasing influence of information technology on human life, the process of teaching and learning has undergone many changes.

Electronic teaching or virtual teaching is considered as an important academic and cultural leap because this type of learning enables learning without time and physical limitations and in a way tailored to the needs of individuals<sup>6)</sup>.

Teaching methods can be divided into active and passive approaches. The game is considered as an active approach of teaching. It appears that game method can result into better concentration and deeper learning for students<sup>7)</sup>.

One of the teaching strategies is digital game-based learning. Games can revolutionize university teachings because they can increase the motivation and involvement of students<sup>8)</sup>.

Students' learning motivation, learning ability and game skills can be key factors that influence gaining knowledge through digital games<sup>9,10)</sup>. Multimedia design for teaching should apply and mix the strongest features of interactive multimedia design to prove effective<sup>11)</sup>.

Currently, one of the syndromes of learning environment is insufficient motivation or lack of motivation in different levels of study<sup>12)</sup>. Therefore, because of the plenty advantages that gamification has

for the learners and the role it plays in increasing the pleasure and the efficiency of learning, it has turned into a popular approach in education industry<sup>13)</sup>.

Considering the importance of the subject, the necessity of its teaching to internalize students' leaning, the importance of using this teaching toward the improvement of the function and future career of students.

The current study aims to focus on developing gamification as an addiction teaching and examining its effects on students' motivation and enjoyment.

### **Material and methods:**

This is a quasi-experimental study on three groups of 2-year public health students in mental health and addiction course (15), first year medical students in health psychology course (42) and clinical medicine (the last three years of M.D. students)( 20) with convenient sampling . All public health and medical students in basic sciences enter to study as a self-blended learning(one of blended learning models) . Medical students enter clinical wards to be studied by a candidate using the application.

The self-blended model is one of the blended learning. *In* this method students take [online courses](#) in addition to their traditional face-to-face [learning](#). Students follow this approach to supplement what they have learned, need and interest .This model of blended learning gives a chance to students to consider their situation and flexible time to work with learning contents in teaching environments. Also this learning content was an important part of students' assessment in final exam .

Students in clinical passed psychiatric course and substance abuse is one of the contents that teaching in this courses . The experience of this students could be useful in gamification assessment and learning indicators .These students enter the study by interesting .

Different students in filed and educational levels help to deep assessment of gamification and assessing all learning indicators by similar assessing tools. Learning indicators were gamification engagement and the effect of this program on motivation and another learning indicators .This indicators have been individualized by students' experiences of using gamification .Assessment of gamification by students at 3 different levels and fields help to assessing the effect of educational program from different perspectives. Gamification is a new trend in

medical education and assessing effect of them is an important issue in medical education .

**Educational Design**

The teaching content of this game was designed in such a way that gamification was designed in multiple choice, matching and blank tests in different sections of reasons, prevention and treatment. The other part included pictures of drugs, their types and categories, drug therapies and abstinence-based recovery through case based learning .

Using standard criteria to construct high quality questions was considered in all types of questions (14).

Three main elements of dynamism, mechanism and components were taken to develop gamification design . In the dynamism section, the skill to be able to communicate between sections, the ability to promote to another level, barriers and limitations were taken into account. In the section of mechanism, challenges, opportunities, competitions, cooperation, feedback, access to resources, rewards, punishment and rewarding points were used.

The main game design components' such as avatars, medals, , fights, increasing the freedom level, receiving gifts, leaderboard, barriers, team status and virtual things were used.

Using Microsoft Asp.net Core Technology was considered to design and implement Back-end web application.

The following actions have been taken to design the gamification:-**Registration**



**Figure 1:** The picture of entering the game environment

**-Desktop**

In this section, the user can access the following information and facilities:

Level and status

Medal achievement

Ability to select future tests

Ability to repeat previous tests

Ability to retrieve parts



**Figure 2:** Desktop and different parts of the tests in users' page



**Figure 3:** Multiple choice questions and feedback with different colors and emoji's



**Picture 4:** feedback to the correct questions and the correct questions in a row



**Figure 5:** A feedback sample at the end of the stage and depicting the user's level and status

Data collection tools: The data collection tools were two valid and reliable questionnaires which were

tested in 3 group of students

To check the influence of gamification on motivation of students by educational program and limitation of this program by students' opinion, a 23 item questionnaire in 5 continuum likert scale was used. This questionnaire was used by Mosallanejad and Abdollahi 15.. in Iranian sample. Validity of questionnaire was measured based on the content validity by experts and validity indicators.

The reliability of questionnaire was approved with correlation coefficient of 0.74.

The current research used another questionnaire created by Fu et. Al to evaluate learners' enjoyment of e-learning games<sup>16</sup>

This questionnaire has been created in 42 items and in 7 sections and 8 fields. These fields include 8 questions on focus, 5 questions on clarified purposes, 6 questions on feedback, 11 questions on challenge, 9 questions on independence, 7 questions on motivating factors, 6 questions on social interactions and 5 questions on the development of information and knowledge.. First, the questionnaire was translated and then examined for validity by 10 students and

two experts in the field of language. Afterwards, it was used in a pilot study on 20 students. The calculated Cronbach alpha coefficient for all items was reported 0.082.

**Ethical Clearance :** this paper approved in ethical committee in Jahrom University of Medical Sciences

**Results:** 15 public health students who passed the mental health and addiction course(93% of them was female and the rest 7% were male), 42 medical students who passed a health psychology course (54% female and the others were male) and 20 medical students (in the clinical phase of their study) entered into the study( 23% was female and the others were male).

And the results of enjoying e-learning games are given in Table 1. The result of the examining the enjoyment of the students shows that in students' opinion, gamification has been able to create concentration, boost social communication, increase the sense of engagement, enable student to self-create the challenge, receive feedback and clarify goals.

**Table 1: Participants enjoyment of gamification (n=77)**

Dimension	Items	Yes (%)	No (%)
Concentration	The game attracts my attention	63.33	36.67
	The game has a content which provokes me	66.67	33.33
	Most of game actions are related to learning	70	30
	There is no distracting point in the task	60	40
	I can keep on concentrating on the game	73.33	26.67
	I will not be distracted from what a player should focus on	60	40
	Unrelated tasks are not imposed on me	80	20
	What I am asked to do in the game is enough	70	30
Clarification of the goal	The goals of the game were clearly explained in the beginning	66.67	33.33
	The goals of the game were clearly explained	66.67	33.33
	The middle game goals are clearly explained in beginning of each stage	60	40
	The middle game goals are clearly explained	70	30
	I understand the teaching goals during the game	83.33	16.67
Feedback	When I am progressing the game, I receive feedback	63.33	36.67
	Quickly after doing my activities, I receive feedback	83.33	16.67
	Quickly after tasks, I receive messages	80	20
	Quickly after new incidents in the game, I receive messages	70	30
	Quickly after winning the middle game goals, I receive information	66.67	33.33
	I receive information about my scores, level and status	80	20

Dimension	Items	Yes (%)	No (%)
Challenge	I enjoy the game without feeling stress or anxiety	76.67	23.33
	Challenges are enough. They are neither so hard nor so easy	73.33	26.67
	The game provides me with guides in a form of notification to enable me to finish the challenge successfully	83.33	16.67
	The game has online support that helps me finish challenge successfully	76.67	23.33
	The game provides me with video or audio files which helps me finish the challenge	60	40
	My skills are improved after finishing each challenge	70	30
	I am encouraged when my skills are improved	63.33	36.67
	Challenges become harder when my skills are improved	76.67	23.33
	The game provides me with new challenges with an accepted speed	66.67	33.33
	The game has designed different levels of challenges for different players	73.33	26.67
Autonomy	I have control over the menu (such as start, pause and save)	80	20
	I feel I have control over role activities and things	63.33	36.67
	I feel I have control over communication between roles or things	60	40
	The game does not let players make so many mistakes not to be able to proceed with the game	76.67	23.33
	The game supports me when I recover from my mistakes	80	20
	I feel I use strategies freely	63.33	36.67
	I feel I have control and influence during the game	70	30
	I know the next step in the game	80	20
	I feel I have control during the game	83.33	16.67
Immersion	I do not feel time passing when I play the game	66.67	33.33
	I become unaware of my surrounding when I play the game	73.33	26.67
	I forget about the concerns in my daily life during the game	76.67	23.33
	My feelings about game changes over a course of time	76.67	23.33
	I can become deeply involved in the game	66.67	33.33
	I become emotionally involved in the game	73.33	26.67
	I have become viscerally involved in the game	73.33	26.67
Social interaction	I have a sense of cooperation with my classmates	80	40
	I strongly cooperate with my classmates	83.33	16.67
	Cooperation in the game is beneficial for learning	76.67	23.33
	The game supports social communication between players (through chat etc.)	80	20
	The game supports in the game's internal society	70	30
	The game supports external societies of the game	80	20
Knowledge improvement	The game increases my information	83.33	16.67
	I receive the primary presented ideas and I interpret them	60	40
	I try to apply my information during the game	73.33	26.67
	The game encourages players to apply their information	60	40
	I want to know more about information received	63.33	36.67

The following table shows the results of examining game motivation on students. The qualitative average of the game, based on the effect of the game on students' motivation, is depicted in Table 2.



**Table 2:** The influence of gamification on the motivation of the students (n=77)

question	Mean of Likert	Standard deviation
This teaching method has a significant role in motivating learners	4.01	0.68
This teaching method increases the ability of learners to apply them in professional settings	3.99	0.38
This teaching method increases self-management ability of learners	3.66	0.47
Using this teaching method decreases the self-confidence of learners	2.16	0.62
This teaching method plays a role in enjoyment of learners	3.92	0.62
This teaching method decreases internal motivation of learners for learning	2.03	0.93
This teaching method decreases external motivation of the learners for learning	2.96	0.76
This teaching method creates interesting and entertaining activities for learning	4.98	0.84
This method is influential in creating understandable activities for learners	3.82	0.76
This method improves the behavior and function of learners	3.90	0.75
This method tries to change the behavior and function of learners	3.65	0.21
Gamification can decrease social skills of learners	2.32	0.19
This teaching method causes a deep learning in learners	4.95	0.21
This teaching method increases students' general information on subject of education	3.80	0.93
Working in the game environment is pleasant	3.78	0.63
Learning with games creates an indescribable sense of happiness and excitement in learners	2.78	0.93
Appropriate teaching feedback are designed	3.65	0.78

The limitations of gamification in students' opinion listed in table

**Table 3-** The limitations of gamification in students' opinion (n=77)

Question	Mean of Likert	Standard deviation
My severe interest decreases after using the game over and over	1.95	0.32
In my opinion, gamification does not meet goals that health team have	1.96	0.9
Learning through this method directly depends on personal abilities and characteristics of users	3.94	0.63
In the game, some of rewards are exaggerates and unrelated.	2.72	0.61
In my opinion, teaching games decreases the function of the learners	1.98	0.64
The efforts made in the game may not be for gaining a deep understanding of a subject	1.98	0.23

**Discussion:**

The current study focuses on presenting teachings related to addiction in the form of gamification for medical sciences students and other members of society. This study showed that gamification has a positive influence on motivation and satisfaction and can influence concentration, clarification of goals, feedback, creating challenge, promoting

self-governance, interacting in creating required knowledge, creating social communications and concentration on promoting learning and motivation of students. This results confirmed by many papers . Some evidence showed that such elements have a positive effect on users and other learning indexes too. <sup>17-22</sup>

Current study showed that gamification effect to students' motivation. This result is also consistent with the findings of another study.

The influence of game to motivating students has been proven as an influential and important factor in many other studies<sup>23-30</sup>

Current study design by case based in some parts. This form of question effect to developing deep learning by problem solving skills.

In the study by Lee and Hammer (2011), they depicted that gamification can be influential in students' learning and increases the learner's problem-solution skills in a complicated form that encourages the learner to discover the problem<sup>31</sup>

Wang & Lieberoth (2016) examined the influence of attention and sound on concentration, interaction, pleasure, learning, motivation, and dynamic classes by using learning platform of Kahoot game on 593 students. They concluded that using platforms based on Kahoot game has a positive effect on dynamism of the class, interaction of learning and motivation of students<sup>(32)</sup>.

Therefore, the results of the aforementioned study are in line with the current study and both of them show that gamification can be influential in creating motivation.

Rahman's (2018) stated that students are specifically interested in doing activities in gamification. It is concluded that Perceived Ease of Use (PEOU) is a better index compared to gamification in students' opinion<sup>33</sup>

The study showed that students have a positive attitude towards gamification of addiction and they reported motivational indexes with multiple advantages into high average.

Cheong (2014) which examined the level of students' understanding of game design elements. It was concluded that all the game factors were presented to the respondents and a very high score was achieved. It became clear that bachelor students have a good understanding of the systems which use game factors and are willing to use them<sup>34</sup>. This result is also consistent with the findings of the current study.

Regarding interaction and use of skills, the results show that gamification of addiction affects information enhancement, social communications achievement, engagement, self-regulation, challenges creation, feedback reception, concentration, clarification of the goals and the satisfaction of the students. The results

show that the game elements may increase instinctual motivation. Researchers concluded that gamification has a positive effect on interaction of students<sup>35, 36</sup> and the results are in line with the current study and both confirm the effectiveness of gamification of the level of interaction of learners in the class.

In addition, Faiella et. Al (2015) depicted that using gamification should be correct and strategic in order to create a high level of learning status and motivation and result into positive social, mental and cognitive effects<sup>37</sup>.

In current study, self-blended learning is used to teach the contents as a blended learning models. This model has an effect on learning indicators. Some research results confirm this outcome.

Atmacasoy and Aksu (2018) in their review study worked on Turkish universities and concluded that mixed learning based on the gamification has a positive effect on the motivation and success of students and the findings of the current study agree with it<sup>38</sup>

Khe Foon and Meng (2016) showed that, there is no statistically significant evidence of increased student scores after the test, the quality of the function of participants in the experimental group is generally higher compared to the control group. In addition, the study showed that using the mechanic of the game had a positive effect on the motivation of students for interacting with more challenging activities in this period<sup>39</sup>.

Researchers also emphasize the use of multimedia learning and case base learning to promotion of students learning compare with traditional teaching<sup>40,41</sup>. This results confirmed the current results and educational elements used in development of gamification,

One of the **limitations** of this study is that it has been done in only one university and on 3 groups of students. Future studies should consider different groups of students to make it possible to examine the effects of gamification on different aspects of learning.

### Conclusion:

Considering the design and pilot study done on students and examining the influence of gamification on learning, satisfaction and the motivation of learners, it can be expressed that using novel and active methods by engaging students in learning and creating an attractive environment can help the

effective and deep learning of the students while it also enabling the enjoyment of learning in a motivational environment. Applying student-centered and active methods in medical education is recommended. It is hoped that applying effective technology in teaching creates positive effects on it.

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**Authors' contribution:**

LM participate in idea of article, study design, gamification development, data gathering , Writing and submitting manuscript, Editing and approval of final draft.

EM participate in gamification development, data gathering, Writing and submitting manuscript

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