



Gamification-based Education for University Students: A Systematic Review

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Abstract

Background: One of the highly effective teaching and learning strategies in the education system is gamification or educational games. This review aimed to investigate the effect of gamification on the satisfaction and learning of Iranian university students.

Materials and Methods: In this systematic review, a systemic search of online databases (Medline, EMBASE, Scopus, Web of Science, ERIC, SID, CIVILICA, Magiran, and Google Scholar search engine) was conducted for relevant studies with no time limit up to April 2022. Two reviewers evaluated the quality of eligible studies and carried out the selection procedure. The quality of the information was evaluated using the Medical Education Research Study Quality Instrument (MERSQI).

Results: Six related studies were selected. Based on the results, gamification in learning can alleviate various modern educational difficulties, including decreased student engagement, motivation, and a lack of cooperation. Also, most students were satisfied with the game (90%), and gamification as a new educational method effective and wanted to continue the process in college. Also, 87% of the students evaluated their learning through game-based teaching better than other methods.

Conclusion: Gamification could be an effective alternative to conventional teaching in shaping the students' satisfaction and learning. Further investigation is required using other game elements that promote cooperation, autonomy, and personalization.

Key Words: Education, Learning, Gamification, Students, Iran.

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1- INTRODUCTION

Gamification is the use of game-playing elements and thinking in non-game contexts (1, 2). The purpose of gamification is to stimulate interaction, meet the needs and interests of people, create entertainment, promote loyalty, engage the mind, influence and change behaviors, and develop the desired behavior. Gamification can be effective in virtual education where there is no direct contact between learners and teachers. It can encourage the minds of an audience who have low motivation and persuade them to learn. In gamification, elements of game-playing such as prizes or achievements, showing progress, awarding medals and badges, leaderboards, and points are used. The basis of gamification is the use of elements such as medals and championships to motivate learners. The effort of learners to receive medals and a higher rank and more involvement with the educational subject ultimately leads to better grades. This way, gamification can attract the comprehensive attention of learners by strengthening the sense of progress towards the goal and increasing the desire to learn by creating higher motivation (3).

Often, learners with similar learning abilities and talents show great differences in academic achievements. These differences are seen not only in learning different subjects but also in non-academic activities. This aspect of human behavior is related to motivation (4). Motivation is the foundation of human behavior and is the driving force of human activities and their guiding factor (5). Academically motivated learners find the willingness to complete a task, achieve a certain degree of competence at work, and ultimately succeed in learning and academic activities (6). These issues highlight the importance of innovative learning tools that help absorb and retain knowledge, increase motivation, and enhance learning by

creating a dynamic, fun, and exciting environment through gamification. Educational experts believe that the best way to motivate learners is to improve learning conditions and increase the quality of educational methods (7). Gamification is currently a technique to increase the motivation of learners and strengthen user participation, especially in teaching where fun and interesting teaching activities are required (8, 9). This way, by creating a real environment, learning goes beyond the mere acquisition of knowledge and moves on to develop skills necessary for recognizing, analyzing, and selecting knowledge for different situations (4, 10).

A review study by Šćepanović et al. (2015) showed that using games in the learning process promotes motivation, attending classes, participating in discussions, and completing additional tasks (11). Serious games, as effective learning tools, contribute to active, experimental, and problem-oriented learning and have an important role in classroom learning activities as an educational program (10, 11). Therefore, many games have been used to teach different skills. This review aimed to investigate the effect of gamification on the satisfaction and learning of Iranian university students.

2- MATERIALS AND METHODS

2-1. Study Design

This systematic review was conducted based on the guidelines of the Associations for Medical Education in Europe (AMEE) (12); 1. General information (e.g., author, title, and publication year), participant characteristics (demographics and sample size), and characteristics of the educational content (the topic and its context, e.g., digital or analog, and the type of the study or profession); 2. Intervention (game element(s), and attributes); 3. Study outcomes (satisfaction, attitudes,

perceptions, opinions, knowledge, behavior, and outcomes); 4. Study quality, and 5. Theoretical frameworks to design or evaluate gamified educational programs.

2-2. Eligibility criteria

Participants, interventions, comparators, and outcome (PICO) was used to formulate the review objective and inclusion criteria.

2-2-1. Participants: Iranian university students.

2-2-2. Interventions: The included studies were non-interventional, so a comparison group did not exist.

2-2-3. Comparators: We did not have a comparison group and intervention.

2-2-4. Outcomes: The impact of gamification on students' learning.

2-3. Included studies

Peer-reviewed journal articles on the use of gamification or game elements in the learning of Iranian university students were selected, including case-control studies, cross-sectional, qualitative, and descriptive and analytical studies. Studies were published in English or Persian up to April 2022.

2-4. Exclusion criteria

Articles were excluded if they (a) only described the development of gamified learning activities in educational contexts without reporting the effects of their interventions, (b) only focused on qualitative data, (c) focused on serious games, (d) focused on patient education, (e) described adapted environments such as game-shows (e.g., "jeopardy"), and board-games (e.g., "monopoly" or "trivial pursuit") which were considered game contexts, and (f) were not written in Persian or English.

2-5. Information sources

A systemic search of electronic databases Medline (via PubMed), EMBASE, Scopus, Web of Science, ERIC, SID, CIVILICA, Magiran, and Google Scholar search engine was conducted. The search was done independently and in duplication by two reviewers, and any disagreement between the reviews was resolved by the supervisor.

2-6. Search

Search words were a combination of (students OR university students OR Iranian students) AND (gamification OR educational games OR video games OR digital games OR games OR computer-assisted gaming OR computer games OR electronic games OR gamified OR gamify) AND (education OR learning OR training OR satisfaction).

2-7. Study selection

Database search was done for possible studies, abstracts of the studies were screened for eligible studies, full-text articles were obtained and assessed, and a final list of included studies was made. This process was done independently and in duplication by two reviewers, and any disagreement was resolved by the third reviewer.

2-8. Quality assessment processes

The Medical Education Research Study Quality Instrument (MERSQI) was used to measure the methodological quality of the selected studies (13). MERSQI is designed for measuring the quality of experimental, quasi-experimental, and observational studies and consists of ten items covering six domains (study design, sampling, and type of data, validity of evaluation instrument, data analysis, and outcomes). The maximum score for each domain is 3, and five domains have a minimum score of 1, resulting in a range of 5–18 points. According to MERSQI, all selected

articles had the necessary quality to enter the study.

2-9. Synthesis of results

Due to the difference in the included studies, study designs, lack of control groups in some studies, sample size, type of intervention, duration of intervention, and the field or participants, a meta-analysis was not conducted.

3- RESULTS

The study selection process is shown in **Figure 1**. A total of 274 articles were identified, of which six studies met the inclusion criteria of full-text screening.

1. A qualitative study was conducted on professors and practitioners in gamification and organizational training who were experienced in gamification, gamification in training, and organizational training. The study aimed to identify and model the factors affecting the success and failure of gamification in organizational training. The results showed that the most important factors were the demographic characteristics of the staff, availability of infrastructure and facilities, information literacy, the attitude of the staff and the management toward gamification, the gradual application of gamification in the training process, and rich (learning) content. Among these seven factors, the demographic characteristics of the staff and the availability of infrastructure and facilities were the most influential factors, while rich (learning) content was the least (14).

2. A quasi-study on 23 medical students (control group=12, intervention group=11) aimed to investigate the effect of games on teaching oncology. The students took two oncology sessions. In the first session, the basic principles and concepts of oncology were taught. In the second session, the students were randomly divided into two groups. A selected, modified text on esophagus cancer treatment (up-to-date

version 17.3) was presented to both groups, and the intervention group received special cards containing a cancer treatment modality. The students were asked to sequence the possible treatments for the case. At the end of the session, the treatment for esophageal cancer was presented to the students. The findings showed a statistically significant difference between the mean scores of the control (28.46 ± 22.6), and intervention (55.8 ± 26.1) groups ($t=2.67$, $df=17.63$, $p=0.016$). It was concluded that although both groups spent an equal time on it, the game led to more concentration and deeper learning in the intervention group (15).

3. A semi-experimental study on Bachelor of midwifery students at the Isfahan University of Medical Sciences aimed to assess the impact of game-based learning on satisfaction and learning in social psychology lessons. The game-based learning and the lecture method were used in two class sessions each. The results showed that 87% of the students evaluated their learning using game-based teaching better than other methods. The mean (SD) in game-based teaching was 14.82 (3.66) versus 13 (3.34) in the conventional group. The comparison of these two methods with the paired t-test showed a significant difference ($p = 0.000$) (16).

4. A cross-sectional study on 20 students of the paramedical faculty of Ahvaz Jundishapur University of Medical Sciences aimed to design, implement, and evaluate a peer educational escape room game to enhance the knowledge and skills of students. The game was implemented in several stages: needs assessment and feasibility, scenario and escape room design, preparation, implementation of the game, and evaluation. The results showed that most students were satisfied with the game (90%), considered escaping from the room a novel, effective educational method, and wished to continue the process in college (17).

5. A quasi-experimental study was conducted on 60 undergraduate students of architecture at the Parand Branch of Islamic Azad University in educational workshops to evaluate the effectiveness of educational games on the mental perception and promotion of learning. The intervention group was trained in a game-like manner, and the control group received conventional training. The results showed that the speed of brain function and the accuracy of students in the intervention group were significantly different from the control group. It was concluded that serious games in main architecture courses were effective in improving students' perception and learning (18).

6. A quasi-experimental study on 15 university students (of public health, medical, and laboratory sciences) evaluated the implementation of mental gamification from blended learning based

on the flex model and its efficacy. Technical and educational designs were used for mental illness lessons for undergraduate and executive groups using the flex model. In the technical design, three parts on dynamics, mechanisms, and elements of gaming were considered. The effect of this educational program on the students' learning, motivation, and satisfaction was studied by quantitative and qualitative analyses. The results showed that students tended to use gamification if it was easy to access and use and believed useful in their learning. The analysis of findings showed that the efficiency and effectiveness of mental gamification are high. Based on the mean and standard deviation (SD) of usefulness, the students strongly agreed with the usefulness of mental gamification, indicating that using classroom gamification technology could be effective in their learning (19).

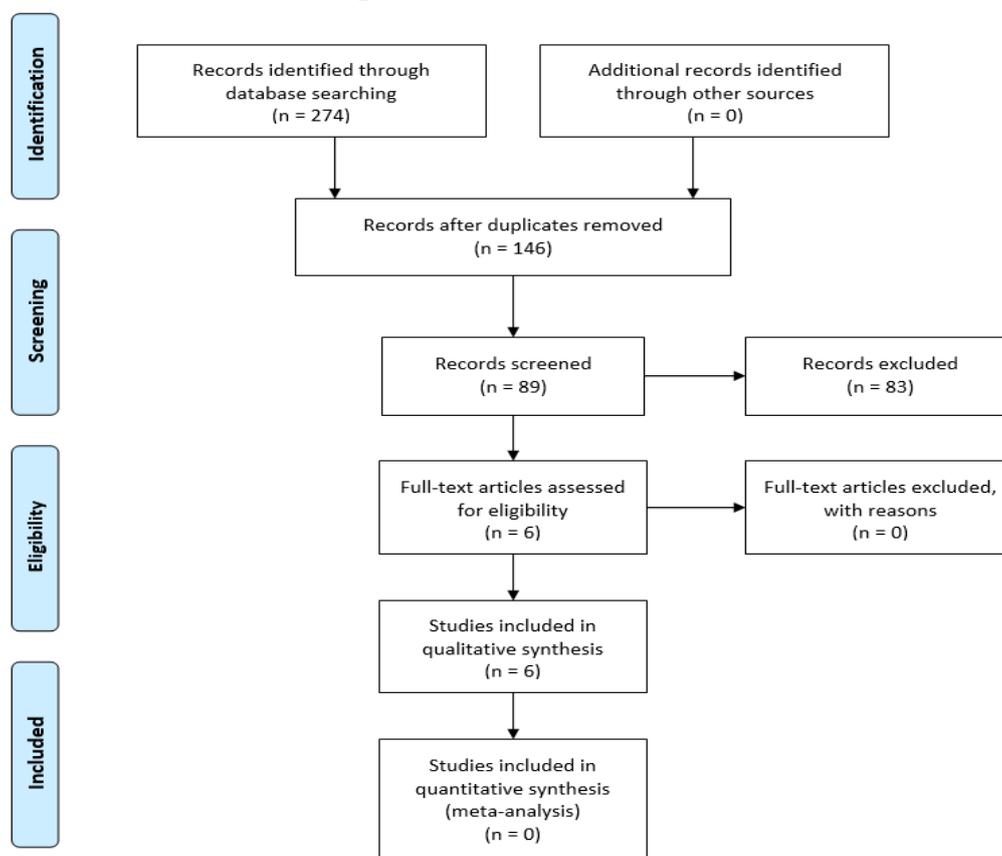


Fig.1: PRISMA Flowchart.

4- DISCUSSION

This study aimed to investigate the effect of gamification on the satisfaction and learning of Iranian university students. Based on the results, student satisfaction with gamification was high, and 87% of the students evaluated their learning through game-based teaching better than other methods. Deterding et al. define gamification as the use of game design elements in areas other than the game. The history of the emergence of gamification and its entry into digital media goes back to 2008, but the game was popularized in 2010 (20). Gaming is a voluntary, enjoyable activity that separates the individual from the real world. The ability to play is an important human characteristic. Today, game-based learning is proposed for adult education also (21). Playing increases the motivation of learners by activating the imagination, creating challenges, and arousing a sense of curiosity (22).

Research shows that educational games increase seriousness, diligence, decision-making, problem-solving, cooperation, and initiative during learning (23). Numerous studies indicate that games, if well designed, can facilitate learning and motivate learners (25, 24). Wilfried states that playing is an excellent way to combine meaningful learning with fun (26). The unique combination of pleasure, encouragement, and feedback changes learning from dull and repetitious work into a form of fun and entertainment (27). Up-to-date and attractive methods that create deeper learning should be used in teaching (28). However, traditional methods and modern teaching methods each have their characteristics and efficiency, and teachers should choose the method with the highest efficiency according to the content of their lessons (29, 30). Teaching and learning are among the most popular areas for gamification (31). The extensive growth of game-based

learning is due to the tedious and unattractive nature of traditional education, student expectations, and the increasing popularity of digital games (32, 33). Game-based learning creates the excitement that is missing from traditional education and everyday life (34). The unique combination of fun, encouragement, and active feedback transforms learning from boring to exciting. It is, however, noteworthy that if gamification is not consistent with the learning objectives, its value and benefits are diminished.

5- CONCLUSION

Due to the popularity of using games in learning among students, gamification can be used as a novel educational method at the university level. The results of the present study showed the effectiveness of gamification in improving the students' satisfaction and learning. Further investigation using other game elements is required to promote cooperation, autonomy, and personalization. Gamification makes learning fun and engaging, resulting in better participation, higher motivation, and ultimately, the interest and fervor of students to learn. The gamification strategy challenges the participants to perform to the best of their abilities.

6- AUTHORS' CONTRIBUTIONS

Study conception or design: RR and AM; Data analyzing and draft manuscript preparation: RR and KS; Critical revision of the paper: AM; Supervision of the research: RR and AM; Final approval of the version to be published: RR, KS, and AM.

7- CONFLICT OF INTEREST: None.

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