Challenges of Implementing Gamification in Medical Education: A Scoping Review

Afifa Tabassum

ABSTRACT

The objective of this scoping review was to identify the challenges in implementing gamification in undergraduate and postgraduate medical education. Three electronic databases, including Google Scholar, PubMed and Pakmedinet were searched for articles published between 2010 and 2021. Eleven articles fulfilled the inclusion criteria. Included articles comprised of 3 original articles, 5 reviews, 1 each of commentary, case study and letter. Majority of the studies (9, 81.8%), addressed administrative and logistic issues. 6 (54.5%) studies analyzed the issues related to learners and 5(45.5%) studies each analyzed the issues due to game design and faculty factors.

In conclusion, the trend of using gamification in medical education is increasing owing to their potential of improvement in learning outcomes and increase in student engagement. But the challenges and barriers to successful gamification implementation need to be analyzed in advance at the institutional level so that strategies to combat these issues may be developed

Keywords: gamification, teaching-learning, medical education, challenges, Educational technology

INTRODUCTION:

Gamification is defined as the use of game elements in non-gaming contexts [1]. It is also described as the process of using game mechanics to increase audience engagement, influence behavior and achieve desired outcomes[2]. Game design elements are those elements that are characteristic of games[3]. There are several game elements that can be utilized in creating a gamified experience based on learner needs and goals. They include progression tracking, badges, points, leaderboard, feedback loop etc[4]. It potentially increases motivation and engagement in the learning tasks, while making learning fun and competitive [5,6]. Several theories have been applied to explain gamification, including the Self-determination theory, situated learning theory, achievement goal theory, social cognitive theory[7] and a more focused Theory of Gamified Learning by Landers.[8]

Gamification is at times is confused with game-based learning or serious games but they are essentially dissimilar. Games are utilized in Game-based learning and serious games to achieve learning outcomes, teach specific skills or to bring about change in learner behavior, whereas gamification is utilized to improve the students' learning experience[9]. With the presence of millennial learners, the use of gamification is becoming more popular in education [6,10]. However, it is only recently that these approaches have been utilized in medical education. Gamification is being incorporated in preclinical and clinical medical education, and patient education[6,10]. To incorporate gamification in medical education, platforms such as Kahoot, Socrative, Mentimeter and others were utilized[11,12].

Despite its increasing use, evidence on several aspects of implementing gamification in medical education is sparse. One area is the evaluation of gamification in improving learning outcomes[10]. Furthermore, issues of implementing gamification in several educational fields have been studied[13,14] but there is limited analysis of the challenges health educators face or issues that arise in the effective implementation of gamification in medical education[15]. The purpose of this scoping review was to identify the issues and challenges in the implementation of gamification in undergraduate and postgraduate medical education.

The research question was:

- What are the issues or challenges in the implementation of gamification in undergraduate and postgraduate medical education?

METHODOLOGY

The scoping review was based on the five-step model by Arksey and O'Malley: 1) determining the research question 2) identifying relevant studies, 3) selecting studies, 4) data charting, 5) collating data and presenting the results.

Search strategy

Google scholar, Pakmedinet and Pubmed were used for data search (table 1). Following keywords were used to perform

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data search: "Issues" OR "challenges" AND "Implementation" AND "Gamification" OR "serious games" AND "Undergraduate medical education" OR "postgraduate medical education" OR "medical student"

Study selection

Original papers, Review articles, Commentaries, Conference papers, Book chapters, letter to editor and studies on gamification and serious games in undergraduate and postgraduate medical education were included. Working group reports, editorials, articles on simulations and augmented reality games and articles on gamification in other health professions educations were excluded. Based on inclusion and exclusion criteria articles published in English from 2010 to 2021 were retrieved. The article title and abstract were screened. Full text of the screened articles was downloaded. Articles with "challenges or issues" present in title or discussed in results or discussion section were included. The reference section of these articles was manually searched for relevant publications.

Data extraction

Main information extracted from final articles included the author, year, study type and main issues highlighted (Table1). The extracted data were analyzed by the author. The PRISMA-ScR checklist was used for reporting.

RESULTS:

The process of study selection is shown in Figure1. A total of 353 articles were identified after searching the databases. 340 articles entered the title and abstract review phase after removal of duplicate articles. The final review included nine articles based on relevance. Following a manual reference search, two more studies were included.

Overall, the 11 articles included were composed of 3 original articles, 5 reviews, 1 each of commentary, case study and letter. Majority of the studies (9, 81.8%), addressed administrative and logistic issues. 6 (54.5%) studies analyzed the issues related to learners and 5(45.5%) studies each analyzed the issues due to game design and faculty. Issues/challenges in the implementation of gamification can be grouped into four main categories:

Issues related to learner[16,17,18,19,20,21]

The challenges discussed from the learner's perspective are a negative attitude and that they may not take a gamified course seriously. Moreover, stress and apprehension about the competition or sub-standard performance will lead to decreased engagement and poor time-on-task, resulting in sub-optimal achievement of learning outcomes.

Issues related to game development and design[9,17,18,19,22]

The studies discussed that the developers and implementers must be very clear about the context in which gamification is being used, the desired outcomes and the learner characteristics for whom it is intended. If there is no alignment between the games and the learning outcomes, the learner will not be clear on what he has to achieve from the gamification process.

Studies also highlighted the consequences of poor game design:

• If the game elements chosen are not suitable for the level of learner this will again lead to failure in achieving the learning outcomes.

• It can decrease learners' intrinsic motivation and be too focused on increasing extrinsic motivation leading to a greater importance on satisfying the game elements rather than learning

• It can rely on game elements that result in superficial and not deep learning

Hence poor game design may result in an inadequate experience for both learners and developers.

Issues related to administration and logistics [16,18,19,20,21,22,23,24,25]

For effective implementation the main issue was achieving support and consent from leadership. The resources needed to develop and implement gamification was another major concern in logistical issues. To develop gamified content that is aligned with the learning objects, suitable for learner with appropriate game elements requires, a lot of time, effort, funding and expertise which pose challenges in effective implementation of gamification. Other barriers identified were; integration into existing technological framework of the institution, time required for integration of these activities in the curriculum and the technology students would need for accessing the gamified content. An interesting issue highlighted was the perception of managers that gamification led to a lack of discipline in students.

Issues related to faculty [16,20,22,23,25]

The development, integration and conduction of gamified content requires expertise and training. Untrained faculty and lack of awareness regarding the range of options available may be detrimental to the successful implementation of gamification. Other concerns discussed in the studies are lack of support of faculty of gamification because they believe it is frivolous. Developing a complex learning game is also a team effort. Faculty may be reluctant to collaborate and communicate with other team members. Another issue is the feeling of loss of operational autonomy i.e. teacher feels they are losing control of the learning process.

DISCUSSION:

The purpose of this scoping review was to investigate the issues and challenges that affect the implementation of gamification in undergraduate and postgraduate medical education. Identifying these challenges can help future educators in effectively designing and implementing gamification in their teaching practices. This review identified a number of challenges at the administrative, faculty and

Table 1: Data extraction table

Author/ year	Publication type	Conclusions and Issues highlighted
Rutledge C et al[9] 2018	Review	Poorly designed games may lead to negative effects of competition like stress, poor engagement and poor time-on-task and also affect internal motivation
Bigdeli S and Kaufman D[16] 2017	Review	Logistics issues- extensive collaboration required between subject and game experts, lack of guidelines for gamification, required training, cost and time. Teaching and learning process issues- competitive nature of gamification, boredom potential Different learning styles and negative attitude of learner
Muntasir M et al.[17] 2015	Letter	Gamification should promote intrinsic motivation Outcomes should be defined. The users and context in which gamification is being used is important. Gamification is not a replacement for a well-designed and thoughtful experience
Sánchez Mena AA, Martí Parreño J.[18] 2017	Original Article	Availability of resources Students' lack of interest Subject fit Classroom dynamics
Sandrone S, Carlson C [19] 2021	Review	Alignment between the games and learning outcomes Poor compliance and increased preparation time by learners Trained facilitators and staff Time and resources required
Ellaway RH. [20] 2016	Commentary	Medical students' relative inexperience with games Logistics issues- time, cost, hardware and connectivity Lack of skills
Mesko B et al.[21] 2015	Original Article	Lack of access to the internet Students' preference for different formats Students acceptance of gamification
McCoy L et al [22] 2015	Case study	Challenges include: Support of leadership and faculty. Availability of classroom equipment and student mobile technology Redefining the faculty role Game design promoting deep learning Scheduling of TEAL-MEd activities during class time.
Szeto MD et al. [23] 2021	Narrative Review	Lack of expertise of teachers in development of game-based strategies Extensive collaboration and resources required Expensive and time-consuming
Gentry et al.[24] 2019	Systematic Review	Cost effectiveness is a barrier in the use of gamification
Chan K, Zary N.[25] 2019	Original Article	Time constraints Lack of knowledge of available options Availability of resources

learners' level and also in design and development of gamification. Major issues identified are the support of and collaboration with key stakeholders like faculty and administration. In a study on teachers of various higher education institutes it was found that there was a gap in attitude and practices of these teachers regrading gamification. Despite a strong positive attitude only 11.3 % of the teachers were using gamification on a regular basis[26]. In other studies, lack of technical skills, fear of losing leading role, difficulties in classroom management, time and scheduling issues have all been identified as contributing factors to teachers' reluctance to use gamification[27,28,29]. McCoy et al in the discussion of TEAL-Med initiative[22] noted that faculty acceptance was an issue initially. The situation improved after pilot testing during which faculty received positive feedback from students. Logistic support was also identified

Figure 1: PRISMA flow chart showing process of study selection
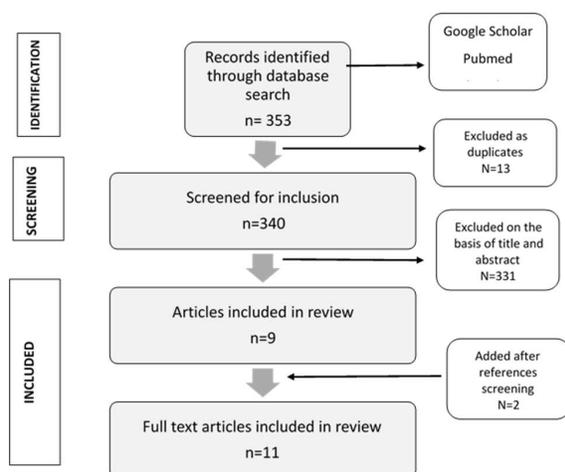
as an important component for successful implementation. In a study that utilized gamification to train pediatric residents in primary survey it was observed that the program faced challenges when administrative resources were reduced due to the pandemic[30]. Similar results about this issue were reported from other educational fields[31,32].

Another important issue highlighted is that of game design and development. Several components of game design and development have been identified in literature that influence the success of gamification like challenges, feedback[33], discovery, emotional entailment etc. This also includes alignment of gamification with context of learning and learning outcomes[34]. Studies show that programs with clear outcomes are more successful. For example the use of Gamified Approach to improve clinical reasoning and engagement of emergency medicine residents in video conference resulted in increased learner engagement. Residents also reported that the unpredictability incorporated in gamification design simulated the actual practice of emergency medicine[35]. In another study Doughnut rounds were developed to improve students' and residents' self-directed learning skills. The format included topic selection, formulation of questions, self-study and quiz competition. According to the learners the competitive format resulted in increased motivation for self-study and ultimately increased learning[36]. The review also supports that choice of game elements influence learning, satisfaction and success of gamification. This view is supported by several studies conducted in higher and medical education. In a systematic review of gamification in Distance Learning Platforms in higher education some challenges that were reported were inappropriateness of gamification for the learners' sensory pattern, difficulty level of activities and boredom due to repetition of activities[37]. In medical education, Kerfoot and Kissan[38] found that introduction of game mechanics (leaderboard and prizes) into simulator education significantly increased urology residents' utilization of the skills Simulator.

Nevin CR et al[39] also reported that internal medicine residents found the leaderboard to be the most important motivator for participation. However they found earning badges to be less motivating, resulting in decreased interest over time. According to the authors' this may be due to lack of understanding of what was required to earn badges. In a study investigating medical student perceptions of gamified audience response system on engagement and learning showed that the variety of game elements helped to keep them interested and focused[40].

Based on the findings of this scoping review, the following recommendations will be beneficial for educational developers and clinicians planning to introduce gamification in their medical education programs:

1. Ensure that the faculty and students are ready for gamification. Sharing the rationale with the students and faculty will help in garnering support and approval[25].

2. Educational alignment between the learning outcomes and the gamification design needs to be established beforehand so as to achieve maximum learning [41].

3. The design should be user friendly and customized for the learners. It should include elements and dynamics that are appropriate for achieving outcomes. Consider recyclability of learning resources so that input and additional time of the faculty is effectively utilized. This will facilitate creation of an archive of resources[41].

4. Pilot - any new initiative should be piloted to identify strengths and challenges before full implementation

5. Provide support- support is essential for successful implementation of any new program. Technical support should be provided to both faculty and students[24]. It may include; training, user guides, help desk/contact person and backup support.

6. Evaluation – this should be an integral part of any educational intervention and should be a planned activity.

Further evidence based on rigorous studies would strengthen our understanding of the utility of gamification in medical education. Research is required in the areas of impact of gamification on student learning at different levels, most effective game elements for different users, the effect of user characteristics on success of gamification and the role of faculty in effective implementation.

CONCLUSION:

The trend of using gamification in medical education is increasing owing to their potential of improvement in learning outcomes and increase in student engagement. But the challenges and barriers to successful gamification implementation need to be analyzed in advance at the institutional level so that strategies to combat these issues may be developed.

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Authors Contributions:

Afifa Tabassum: Design Collection and analysis of data
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