

Gamification in Educational Institutions: Concepts and Difficulties

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Abstract

This paper provides an account of gamification in education. Apart from its emergence, it clarifies how gamification differs from gaming and game-based learning. It also discusses the elements of gamification, its advantages and its principles. It also sketches the theoretical underpinning of the concept, the models, its various applications, and the obstacles to using it in the educational process.

Keywords:

gamification, gaming, game-based learning, educational techniques

1. Gamification in Education

Gamification is one of the modern techniques in education. It was used for the first time in 2002 by Nick Pelling. Nevertheless, the first documented use of this term was in 2008, and it did not actually start working until the second half of 2010 in commercial marketing to promote brands. It has since then become common in various areas such as training, media, health and education [1]. [2] conducted a systematic review of empirical studies to determine the types of educational contexts in which gamification experiences could be applied and to reveal the most important effective playing characteristics in this regard. The authors found that most significant principles of game designs were *Show status* (e.g. using points system, leaderboard), social engagement (e.g., students compete or collaborate), freedom of choice (allowing students to choose the types of tasks or tests or how long they should complete), and instant feedback.

Concept of Gamification

Digital gamification is one of the modern e-learning techniques. It is an old practice, as games enter into many areas in daily lives in general and have been used in education under the name of educational games that contribute to multiple educational goals, perhaps the most important of which is the element of fun and entertainment to the environment educational games, attracting learners' attention towards learning. Each of gamification with educational games aligns the goals that each seeks to achieve.

[3] indicated that gamification is the process by which the mechanisms and ideas of a game can be used to enhance learners' participation and train them to solve their problems. In another perspective, [4] defined gamification as using the characteristics of play outside its contexts to influence the behaviors and attitudes of learners. Alongside these definitions, [5] described it as the use of learner-centered play elements to improve educational experiences, enhance student participation in educational activities, model and teach learning skills, and improve students' attitudes and identities as learners.

Such definitions of gamification can be summarized in the following points:

- Gamification aims to improve the quality of education, not replace it, as the content may be ineffective, so gameplay elements are integrated into that content to give it a kind of impact and effectiveness.
- Gamification is not a game in itself, but rather a mixture of playing elements with educational content to provide an enjoyable education and keep the learner away from memorization.
- Gamification depends mainly on the elements of play employed in contexts other than play.
- Gamification aims to enhance individuals' motivation and improve their levels of participation and enjoyment of activity in pursuit of specific goals.
- Gamification considers learners' characteristics, needs and interests when designing its activities.

Difference between Gamification and game-based learning

The concept of gamification differs from game-based learning. Gamification is the process by which the mechanisms and ideas of games can be used in other contexts to enhance learners' participation and train them to solve problems or give them a set of behaviors. Practicing games in the classroom to help learners acquire and apply concepts or generally improve educational experiences. These practices occur through learners playing various traditional games, such as chess, to teach participation strategies [6].

Table 1. Difference between Gamification and play-based learning and play

Comparison	Gamification	Game-based Learning	Gaming
Purpose	has learning objectives and tasks with some form of reward	Achieving learning goals	For fun, with or without rules and specific goals
scores	Losing points may or may not be possible because the point is to motivate individuals to take some action	Losing points may or may not be possible because the point is to motivate people to take some action	Winning and losing is part of the game
reward	An optional process that must be rewarded	The game may be unrewarding or intrinsically worthless	Rewards are secondary
cost	Easier and cheaper	Expensive and difficult to design	Expensive and difficult to design

Advantages of Gamification in Education

Through its various elements and applications, gamification achieves great benefits in the education process, as these benefits may contribute to making it a distinct method in the educational process.

1. *Fun:*

It can be said that gamification-based learning provides an atmosphere of fun within the learning environment, and this makes it reinforces what it aims to acquire for students because students spend more time practicing gamification-based activities, which enhances their levels of learning experiences Targeted Education [7].

2. *Motivation:*

Gamification contributes to increasing the levels of self-motivation among students by employing many learning methods that provide a more diverse and active learning environment, contribute to the development of group skills and reduce levels of cognitive dispersal, increase the levels of interest among students. Students and their participation in educational activities work to achieve what is called effective learning [8].

3. *Engagement:*

Gamification brings a kind of fun to the educational process and breaks the boredom and monotony that dominates many traditional educational environments. Using elements of play such as exciting storytelling and competition can help the learner who is not self-motivated to engage in the educational experience and survive Pay attention to it, because gamification works to create a so-called state of flow in learners that enhances their levels of participation and learning because they are deeply involved in gamification activities and do not focus on the time factor [9].

In this regard, [7] stated that the reason behind the support of researchers and educators for gamification is the positive outcomes it produces, most notably the voluntary participation based on enjoying what is learned.

4. *Clarity of Learning Objectives:*

Gamification activities are characterized by clarity of educational objectives and steps for their implementation, which contributes to their good achievement. Simply applying the basic gameplay mechanics is simple and brings many benefits. The most important benefit is how the gamification activity is designed.

5. *Facilitating complex topics:*

Gamification facilitates the process of learning difficult topics by providing appropriate educational environments for them, as gamification activities involve all the components of the target course and work on clarifying the relationship between those elements, which motivates the learner Towards confronting these complications, exploring all possibilities, and making decisions until it reaches the so-called full picture through which the relationship between the various components becomes clear [10].

6. *Learner-Centered Design:*

Gamification provides more opportunities for individual learning as there are many possibilities in its activities represented in how to perform the tasks assigned to the learner, control the speed and arrangement of its learning system, and enables learners to receive new information or challenges when they meet particular conditions and thus contributes to providing an educational environment that satisfies the needs of the learner [11].

7. **Immediate Feedback:**

Gamification provides an opportunity to receive immediate feedback on the tasks that the student performs and the level of his performance in them, which makes them aware of their level of progress in performing those tasks or the extent of their abilities to achieve the goals assigned to them [12].

8. **Problem-Solving and Developing Critical Thinking:**

Gamification activities improve students' problem-solving and critical thinking abilities, as one study indicated that the most prominent outputs of education are teamwork and problem-solving, and because gamification includes these techniques, it works to enhance those. It also involves more critical thinking and cognitive activities than traditional teaching methods [13].

It is clear that gamification can be designed and built in educational environments rich in the elements of multiple games, while reducing the high material cost of the educational games themselves, in addition to providing an atmosphere of fun, enjoyment and entertainment in the educational process, which contributes to increasing the participation of learners effectively in activities and tasks. This may contribute to their reaching better cognitive, skill and emotional levels.

Elements of Gamification in Education

The following is a presentation of the most prominent aspects of digital gamification used in education:

A. Badges

The term decorations in the field of gamification refer to a set of digital icons awarded when a standard is achieved, which contributes to enhancing students' motivation levels and achieving the desired goals of the gamification experience. Medals are awarded in the following cases: obtaining specific grades, completing tasks before the date set for it, active participation or other goals decided by the teacher, and there was a conflict in the results of the studies that depended on the element of decorations individually, and this can be explained because the decorations have a positive effect on the social - not cognitive - aspect of the activity when the system is Awarding of honors is optional.

B. Leader-Boards

Leaderboards allow students to know their level of performance compared to their peers. To use the leaderboard system in the classroom, cartoon characters or nicknames are used. In this regard, [14] employed a leaderboard element in an experimental educational environment. This led to an increase in students' abilities to organize the content of knowledge and link it to other relevant knowledge, as [15] indicate that the leaderboards are one of the most gamified elements that contribute to

motivating students and increasing the level of self-motivation, and enjoy their educational courses.

C. Freedom to Fail

It is intended to allow the learner to succeed or fail, as he alone has the decision to succeed, and the element of freedom to fail is linked to video games, where the cost of failure to complete the game decreases with the possibility of starting it several times, and through that learning occurs and success is achieved, the freedom to fail may reduce anxiety According to [16], who included the two components of freedom of choice in parallel with freedom of failure, this resulted in lower rates of stress for (80%) of students.

D. Points

Participants get them once they complete specific tasks, and there is no single agreed-upon method for how points are awarded; Where this varies depending on the nature of the intended course to be taught and what the teacher decides. The teacher may choose to award points traditionally if students complete the optional tasks assigned to them, which makes the educational experience more enjoyable and motivating for [17].

E. Leveling Up

In games that involve complex role-playing, such as Dungeons & Dragons, the levels are determined in light of the points obtained. Each level is named with a specific name that reflects the individual's ability. As the roles progress, the individual's ability, prestige and position in the game world increase. For participants in World of Warcraft, levels are displayed using a leaderboard system to support the spirit of competition among participants [12].

Principles of Gamification in Education

Some general principles must be considered when using play elements in contexts other than play in general and the educational process in particular for these elements to achieve the desired goal to the fullest. These principles are as follows:

1. Understand the characteristics of the target group
2. Determine the goal of gamification activities
3. Choosing the most appropriate gamification elements that suit the learners' abilities and levels
4. Maintain learners' continuity and motivation towards learning the target content.

Self and Social Gamification

When the elements of gamification are employed in the educational program by adding the mechanisms of play in the educational context, the mechanisms of the game can be classified into two parts as follows:

1. **Subjective elements:**

These elements are points, medals, etc., and these elements increase the student's focus on challenging himself or realizing self-accomplishment.

explained the relationship between gamification and psychological and behavioral changes in light of gamification is based on three basic elements motivation, ability level and motivators.

Table 2. Play Mechanics (Subjective vs. social elements)

Subjective elements (Motivating Students to complete the current stage)	Social elements (Motivating the student to move to the next stage)
scores	Leaderboards
level	virtual goods
Decorations and badges	interactive collaboration
Aesthetics	
timers	

2. *Social elements:*

Examples of these elements include leaderboards, which increase the cases of interactive competition or cooperation, and the following table shows examples of the mechanisms of play.

Gamification Theories

Gamification derives its theoretical philosophy from several educational theories. These theories differed in the foundations on which they were based to explain gamification. Among those theories are the following:

1. **Self-Determination Theory**

[18] assumed that self-determination theory represents a reasonable theoretical basis for gamification. It emphasizes innate human tendencies toward psychological development, self-unification, psychological well-being, autonomy and responsibility.

1. **Cognitive Evaluation Theory**

Self-motivation is represented by voluntary participation in activities because it is interesting, enjoyable, satisfying, and carries an ideal challenge. According to the theory of cognitive evaluation, the levels of self-motivation rise with increasing levels of saturation for efficiency and independence, for external influences such as rewards and positive feedback can lead to Reducing or improving subjective motivation based on the pattern of perceiving it as a form of control versus informational support, or viewing it in terms of enhancing or decreasing perceptions of competence and independence [19].

2. **Behaviorism**

Gamification has a strong relationship with psychological theories, especially behavioral theory. [26] stated that gamification could bring about significant changes in human behavior. Many researchers have

3. *Social Learning Theory*

Social learning theory assumes that learning occurs by observing and simulating the behavior of others so that we watch and repeat the behaviors and emotions of others. Therefore this process depends on the factors of social interaction and cognitive processing and ends with the person's understanding of behavior and developing attitudes towards it. This theory is one of the Theories that are very important in understanding the learning process and how it occurs, as well as knowing the most appropriate educational environments necessary for optimal learning.

According to social learning theory, the learning process is influenced by the environment and the interactions that occur within it and focuses on observation and simulation. Sometimes, some call it observational learning—dolls, in which children observe and repeat these behaviors.

There are four principles of social learning: attention, retention, reproduction, and motivation, which can be listed in detail as follows:

1. **Attention:**

The learning process does not occur without the individual's focus on the task, as Bandura hypothesized that social contexts help to enhance the learner's attention or distract him, the more the focus of the group increases the focus of the individual accordingly.

2. **Retention:**

Learning occurs through storing and recalling information because the individual needs to retain the behaviors he has observed to perform them.

3. *Reproduction:*

This principle is consistent with the view that “practice leads to mastery” because repetition and practice of what has been learned to allow the learner to master it.

4. *Motivation:*

When an individual finishes an activity, he notices the consequent reinforcements, which in turn work to enhance his motivation towards repeating it in a certain way or vice versa.

5. *Conectivism Theory*

Connectivity theory combines principles of theories of chaos, networks, complexity, and self-organization. [20] indicates that George Siemens presented the theory in December of 2004 as a learning theory in the digital age and is based on the idea that knowledge exists in the world, in the form of a network of nodes, not in the mind of the individual, and that learning is the process of connecting these knots. It focuses on the idea that knowing how you find this knowledge is more important than the knowledge itself.

[20] stresses that the communicative theory focuses on teaching learners how to search for information, revise it, analyze it, and synthesize it to obtain knowledge. And their participation in group work, and discussion transfers the role of the teacher from a facilitator to a facilitator of learning, while the role of the learner is in the search for information, and linking it, to access knowledge, and this makes personal learning environments one of the best applications of this theory, which allows them to control and interact with their colleagues the way they prefer.

[27] divided personal learning environments into three components: the processes, strategies, and learning technology.

According to the communicative theory, rewards and positive feedback contribute to learners' participation during learning, and points help in the learner's progress and obtaining targeted knowledge from the educational environment. The activities provided contribute to the learner's transition from a level of expertise to a higher level.

With a closer look at the previous theories that explain gamification from an educational point of view, those theories can be summarized in the following points:

- Emphasis on innate human tendencies such as self-unification, psychological well-being, independence and responsibility, competition and cooperation with others, all of which can be found in gamification environments.
- Emphasis on the self-motivation that stems from within the learners, which directs them and motivates them to participate in educational situations.

- pinpointing the impact of changes in learners' behavior by providing or withholding some elements, where positive behaviors can be obtained through stimuli, encouragement and motivation, and correcting inappropriate behaviors through punishment or non-granting rewards.
- Emphasize the importance of the availability of some important elements in the education process, such as clarity of objectives, control, feedback, focus and integration between activity and awareness, and focus and immersion in educational activities.
- justifies the importance of social interaction and cognitive processing factors in the learning process is highlighted; It assumes that individuals learn by observing the behavior of others.
- Focus on motivating individuals through their beliefs or desire to achieve specific goals. Then it is necessary to provide stimuli that contribute to achieving the goals that learners seek to achieve.

Models of Gamification in education

Recent educational studies and literature in the field of gamification have stated that gamification can be applied in the educational process through many models that illustrate the components and elements used in gamification, and those models can be summarized as follows:

1. *Mechanics, Dynamics & Aesthetics Framework*

The model of mechanisms, dynamics and aesthetic values prepared by [21] includes three components for gamification: mechanisms, dynamics, and aesthetics. Particular ownership or alliance are an example of the so-called game dynamics. Aesthetic values describe the feelings and emotions the player feels while playing or the emotional responses that game designers aim to evoke through the mechanics and dynamics involved in games. Examples of these aesthetics are imagination, challenge, dependency, exploration, expression and submission [21].

2. *Dynamics, Mechanics & Components*

In a model of gamification, it consists of three components: dynamics, mechanisms and elements. Dynamics are the most abstract elements representing the general framework of the game or the playing system, and it includes five components: determinants, emotions, narration, progress and relationships. Mechanisms are necessary to include the dynamics of the game, which is the component through which players can be promoted towards participation and behavior according to what is planned by the game designers. It includes ten components: challenges, opportunities, competition, cooperation,

nutrition, returns, get resources, rewards, deals, conditions. Elements are the physical alternative form through which the dynamics and mechanics appear. They are the least abstract components closest to actual play or the gamification system. There are fifteen elements for gamification: achievements, cartoon characters, decorations, boss fights, combos, campaigns, gifting, leaderboards, and content locking. , levels, points, quests, social maps, teams and virtual merchandise [22].

3. *Story Model, Mechanism, Technology and Aesthetics (Schell, 2014)*

[23] presented a model of gamification in which he identified four elements: story, mechanism, technology and aesthetics. The mechanism component refers to the rules and procedures by which behaviors, rewards, and punishments for the game can be determined. The technology component relates to the attitudes, materials, and equipment needed to design the game, and many games are based on information technology. Regarding the aesthetics component, through which the perceptions and feelings of players are determined through audio-visual aids, it directly impacts the players' experiences. Still, this effect depends on the type of story and the mechanism used [23].

4. *Dynamics and Mechanisms Model of Benchabel (2016)*

[24] presented a model of gamification that includes two components: dynamics and mechanics. Self, competition, and enthusiasm, while mechanics have points, levels, challenges, electronic merchandise, leaderboards, and gifts.

5. *The integrative model of Gamification*

Through their review of previous theoretical frameworks in the field of gamification, [22] presented an integrative model of gamification that includes the following components: story, dynamics, mechanisms, and technology. The story represents a pivotal process through which the proposed educational program is directed, and it consists of a set of educational goals and the stories associated with those goals and the stories can be divided into a set of multiple fun activities, and the dynamics include a group of exciting experiences that add a spirit of fun to the story to motivate learners on the participants to learn, and the mechanisms involve the organizing rules of the gamification system, which can be providing feedback and rewards. Examples include leaderboards, points and examples, and technology that makes the mechanisms tangible and visible to learners, including hardware, software, networks, and other tools [22].

With a closer look at the previous models of gamification, the following points can be drawn:

- The convergence of all the models mentioned in their vision of the components of gamification, most of them focus on three main components: dynamics, mechanisms, and technology.
- Some of these models focused on aesthetic values as one of the components through which the perceptions and feelings of the learners are determined, as they directly impact the players' experiences.
- The components of gamification depend on each other. The story component as an entertainment component consists of a set of fun activities that can be presented to the participants through the other components of gamification as the component of mechanisms.
- The integrative model is the most comprehensive of the mentioned models, as it includes the three main components of gamification in addition to the story component.

Gamification Apps

Increasing the productivity of individuals and transforming their ambitious goals into reality is one of the most important applications of the concept of gamification. Still, it is a big difference between working on a challenge in which you feel pressured by your insistence on achieving it, and between working on it while enjoying and not feeling any bad feeling about it, but what if you use one of the Ready-made applications built on the principle of gamification to be more productive and accomplished? Of course, it will become more fun, and from the ready-made gamification applications that can be used in the educational process:

Obstacles to Gamification in Education

Despite the positive aspects of gamification and that it is a successful method in the educational process, there are some challenges facing its use in the educational process, and the most important obstacles to gamification in the educational process can be summarized as mentioned by [25] as follows:

1. *Understanding gamification as a type of learning based on play:*









Many believe that gamification is only a type of learning based on play so that the two concepts lead t to urge The participants get involved in developing their skills in a particular field, and this problem can be explained in light of the confusion in the definition of gamification.

2. *Lack of reasons for gamification in some cases:*

gamification can be seen as a possible solution to a problem or the satisfaction of a need, but before proceeding to determine the choice of gamification, a situation analysis should be done so that gamification is the best solution to that problem.

beginner at the beginning and a master at the end, and therefore the gamification system should be designed within the framework of the educational system so that the mechanisms of playing serve the educational

Table 3. Gamification-ready Applications

	Apps	Details
1	<p>Socrative</p> 	This tool features Space Race, where students race around the device screen and answer questions, students can play this game individually or in groups, and adjustments can be made to the spaceship icons.
2	<p>Kahoot</p> 	This App operates on any device that has a web browser, without the need to enter a password, and also provides teachers with excellent feedback on student performance. During and after the competition, while engaging music is playing, a set of multiple-choice questions appear on the teacher's screen, and students have to answer them quickly and accurately on their computer screens. The leaderboards are updated after completing the answers to each question.
3	<p>Play Brighter</p> 	To complete the tasks for this tool, students have to choose questions from one of the question banks of more than 20,000 questions, and when the students have completed the answers well, they are given some coins with which they can change the game's cartoon characters.
4	<p>Classcraft</p> 	While performing this game, students may play the role of warriors or magicians, they can form teams, and points are gained or lost according to behavior and class performance. Through this performance, the course can be gamified so that students wage battles against the questions directed to them and overcome them by doing solve it properly.
5	<p>Goose Chase</p> 	This tool allows students to use litter animals to hunt students, and its activities include taking pictures, making videos or can be text based, such as finding answers to questions asked online, solving puzzles or completing a puzzle.
6	<p>Breakout EDU</p> 	It consists in finding solutions to puzzles and games or designing them. This tool is designed to develop critical thinking skills. An example is for primary school students to answer the puzzles correctly so they can catch the bus at the right time.
7	<p>Quizizz</p> 	A free tool that allows learners to conduct introductory activities, browse in fun and provide multiple activities for students, works on any device with a browser and does not require a username and password; students go to the Quizizz website, enter the game code provided by the teacher and once the competition is over a report is provided Detailed about student responses that can be downloaded and saved, this tool is similar to Kahoot!, but the competition here is subjective.
8	<p>Minecraft Education Edition</p> 	Through the application, students can be allowed to interact and collaborate in the completion of educational tasks and exchange files with their friends in the world of play related to the content being taught to them.

3. Weak link between gamification and the educational process:

Considering the educational process as a positive experience or a journey in which the learner is seen as a

process, it may lead to weakness The existence of a correlation between gamification and the educational process to randomness in the use of that method and the

failure to achieve the desired goals of using it or resorting to it.

4. *There is no need for many rewards for the gamification system:*

Giving rewards in the form of points, medals or leaderboards at random so that this happens without being associated with something meaningful for the learners negatively affects the learning process, and this explains the absence of the learner's interest and motivation over time because there is nothing it takes effort from them to overcome the challenges they confront.

5. *Inadequate content for all learners:*

Many designers of educational programs based on gamification rely on one game that has proven to be successful in teaching one of the courses so that it is repeatedly applied in many courses, and this in itself does not undermine the design of gamification, but the problem lies in poor embedding, which may not be in line with the needs of learners and the objectives of the course.

6. *Gamification is complex:*

Gamification is a tool designed with the specific purpose of simplifying concepts, and both tool (gamification) and purpose (learning) are involved.

7. *Multiple Choices:*

Due to the tremendous technological development, there is an abundance of games whose mechanisms can be employed in the educational process, which may put software designers at a loss when designing educational programs based on gamification.

8. *Gamification may be considered a kind of distraction:*

One of the most prominent obstacles facing gamification is the addition of playing components without linking this to an educational goal, which results in wasting the time of the teacher and the learner.

These obstacles represent significant challenges to the effective use of gamification in the educational process, so it was necessary to overcome them. This can be achieved through the following things:

- Designing educational programs based on gamification so that the play mechanisms serve the educational process.
- Analyzing the actual needs, to know the characteristics of the target group, and knowing the needs of the learners and what they should know at the end of the course based on gamification, in addition to knowing the

reasons why gamification is the best solution to bring about the desired change.

- Designing educational programs based on gamification so that they serve clear and specific goals so that they are not considered a kind of entertainment and distraction for learners.
- Moderation in awarding rewards and prizes so that awards are linked to outstanding performance, granting privileges to students who cooperate with their companions, and honoring students who repeatedly try to overcome difficulties and achieve the best results.
- Purposeful planning of programs based on gamification so that they serve the educational goals accurately so as not to waste time and effort through defining goals, application options and ways to overcome problems.
- The focus of designers of educational programs based on gamification is selecting the most appropriate elements of gamification that effectively serve the educational objectives.

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