Gamification in Education and Its Impact on Student Motivation—A Critical Review

Mifzala Ansar and Ginu George

Abstract In education, gamification refers to including game characteristics and design ideas in the classroom setting. Over the previous five years, gamification has increased student motivation and academic performance. This study will examine the previous literature to see how gamification will disseminate over time, educational level (from nursery to college), causes, and the most frequently used game elements. A systematic literature review will search interdisciplinary databases for quantitative experimental studies examining educational gamification and providing information on current research lines. According to the findings of a comprehensive research study, gamification can be advantageous at all academic levels, from elementary school to college. Following systematic research, gamified learning can increase students' motivation and intellectual accomplishment. Student learning may be made more pleasurable via gamification, which is the first advantage of this type of instruction. When used in the classroom, gamification can assist students who are weak in motivation and performing poorly academically. Because of the diversity of challenges and rewards that gaming parts provide, incorporating gaming elements into the classroom may serve as a motivational tool for students to learn. In the study's findings, students who enrolled in educational gamification courses were shown to be more interested and participatory than students enrolled in regular classrooms, on average.

Keywords Gamification · Education · Students · Classrooms · Learning · Games · Academic achievement

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1 Introduction

Gamification has received significant attention and interest in recent years [19]. Although many academicians and students are unaware of it, it is already a part of everyday routine [8]. It is possible to apply game design ideas to non-game situations; according to several definitions found across scientific literature, it has been utilized in various disciplines, including business, employment, health, and the environment. This research aims to look at the use of gamification in educational settings.

It is a term that refers to incorporating game design elements into the classroom to promote student engagement while also assisting them in developing their academic, cognitive, and interpersonal talents. Individuals are engaged, motivated to act, and problem-solving is facilitated via various techniques [1]. When it comes to tasks, the student's attitude displays a sense of empowerment, which increases their appeal and nurtures the good features connected with games [24].

Researchers have shown (2021) show that the rapid increase in the number of publications on gamification in education has been going on for at least seven years. The numbers of countries in which the contributing writers are based and the number of institutions to which they are linked suggests a widespread interest in the subject matter throughout the world. It is evident from the vast number of citations and the large cluster of co-citations in this domain that research communication in this field is successful [25].

Rozhenko et al. indicate that the use of gaming technologies boosts the motivation of students, helps to tilt the scales in favor of active learning, and helps students overcome lethargy, especially while studying mathematical fields that are tough [20].

Manzano-León et al. [17] According to student academic performance, dedication and motivation are all predicted to improve due to the gamification in educational settings. As a result of this study, it is necessary to do more research on the demands and obstacles that students have while using gamified learning approaches [17].

2 Features of Gamification

The goal of gamification is to engage individuals in lucid activities that boost their intrinsic and extrinsic motivation [2] and to do it in a fun and engaging way. While extrinsic motivation is driven by the quest for rewards, intrinsic motivation, on the other hand, motivates people because they like the inherent benefits of their jobs [7]. Finding intrinsic motives for gamification tactics is critical for keeping interest levels high. In the self-determination theory (SDT) [3], three psychological needs are—(1) Autonomy (the extent to which an activity is carried out solely for the sake of one's interests), (2) Competence (the sense of ability and ability to complete an action to a specific level), and (3) Relatedness with others—the definition of capability and ability to complete an activity to a particular grade.

As part of the motivating gamification process used by SDT, players (students) must feel autonomous, in command of their activities, and confident in their ability to complete tasks successfully. On the other hand, gamification must consider the different sorts of players to achieve this purpose.

Relational, Autonomy, Mastery, and Purpose (RAMP) is coined by Kindred and Mohammed [12]. Apart from that, game design tools create gamification confined to points, badge, and leaderboard (PBL). In terms of research, the mechanics, dynamics, and aesthetics (MDA) system developed by Hunicke, LeBlanc, and Zubek [28] has been the most thoroughly explored. Video game designers utilize the MDA model to combine the rules mechanisms, game dynamics, and visually appealing aesthetics systems into their games. It is easiest to categorize the gamification aspects into the following categories.

The game's mechanics are related to actions and control mechanisms available to the player. Players can, for example, draw cards, wager, trade, attack, compete, and collaborate with other players in the game. In addition to the mechanics, the dynamics indicate what the player should be doing at the execution time. Socializing, bluffing, contemplation, status, and attention are just a few of the behaviors that may be seen.

When players interact with a gaming system, "aesthetics" refers to the feelings elicited by the system. Sensation, fantasy, story, challenge, camaraderie, discovery, expressiveness, and enjoyment are all included in this category.

3   Gamification, Education, and Motivation

Education gamification, which includes game aspects and clearly defined goals and rewards, encourages students to engage more actively in class. The researchers at Beemer, Ajibewa, and DellaVecchia [25] discovered that children exposed to gamification in physical education were more than twice as likely as students who received conventional instruction to participate in at least 20 min of daily physical activity. Additionally, this study reveals that extra strategies and maximizing engagement during intermissions between programs are essential. Gamification with instant rewards (points and badges) and a narrative framework may be particularly effective. When courses are designed to be more game-like, it has been demonstrated that student engagement and performance both rise considerably in higher education.

Gamifying schools to encourage healthy behaviors leads to an overall more dynamic and pleasant school atmosphere where children may be more active while having a good time.

Using gamification to engage students in science has increased knowledge retention [26, 6]. According to the findings of the study, it is associated with their perception of being active participants in their education, which is bolstered by the game mechanics' progression and practice, which allow them to practice their academic curriculum in real time and provide them with clues and opportunities for reflection as they encounter new challenges. Commitment and engagement are encouraged in

an e-learning university context by implementing a gamified system that includes peer interactions, blogs, challenges, and medals [13], among other features.

The writers can explain it because of a balance between difficulty and students' skills; students can continue through the course with a sense of accomplishment because of this balance between difficulty and students' abilities. Using gamification aspects such as points, badges, and leader boards, for example, students may lose interest in the course and learn over time, and they may become more dissatisfied with their gamified system [17].

4   Problem Statement and Research Objectives

The massive body of empirical evidence on educational gamification, frequently conflicting and refers to various leisure resources, such as instructional video games or game-based learning, are directed. While the implications of educational gamification are still being extensively distributed, more study is needed to define and synthesize present information, ultimately reducing the amount of time necessary to grasp this teaching approach. The use of gamification as a learning technique has been proved in the previous study to generate a significant amount of attention.

The findings of [15] were based on a series of 30 experiments conducted informal educational settings, which revealed that gamification had a more substantial impact on student learning outcomes than the control groups. Student motivation can be increased, can enhance talents, and learning can be maximized using gamification. According to research conducted by Trigueros et al. [27], gamification can encourage students to study, improve their abilities, and maximize their learning. Following these findings, higher education researchers are conducting more studies into the use of game-based learning activities to promote student engagement than was previously thought possible.

4.1   Research Objectives

This study aims to systematically evaluate educational studies that have used gamification in the previous five years, using specified criteria. The following questions are the focus of our investigation. Research Question-1: How can gamification be used in educational environments to benefit students?

Research Question-2: What educational aims do the chosen studies employ gamification? The current study objectives have been selected to get a more profound knowledge of the recent research and application of game-based learning (GBL) in education and discover which educational gamification projects have been most effective and how to reproduce them in future studies.

Table 1 Selection and elimination criteria for articles

Systematic literature review—August–October 2021		
Search area	Web of Science, Google Scholar, Scopus	
Period of study articles reviewed	2010–2021	
Language version	English	
Keywords	"Gamification," "Academic Learning," "School, College, University"	
Elimination criteria		
Total articles sourced		72
Elimination stage-1	Non-specialized websites, Blogs, newspaper articles, Books, Book Chapters, and Theses	(16)
Elimination stage-2	Theoretical and Introspective studies are not considered	(23)
Total articles considered for the study		33

4.2 Research Methods

A systematic review was conducted between August and October 2021 and conducted thorough research to ensure that considered a complete list of relevant studies. The review attempts to collect all available data by previously defined eligibility criteria. This approach results in more reliable findings for concluding and, consequently, decision-making because the findings are more reliable (Table 1).

Used an algorithmic search approach to assemble the systematic review papers [27]. A review of the literature using the databases Web of Science, Scopus, and Google Scholar was asserted. Only English versions of the search keyword utilized were (School or "High School" or "University") and Gamification (Program OR Intervention), and the search period spanned the previous five years (2016–2020).

This systematic review met the following criteria used to narrow the pool of likely candidates: The study materials may be in English only. The study has considered only pieces previously published in peer-reviewed specialized scientific journals for inclusion in the publication. The survey eliminated the following items: non-specialized websites, blogs, digital newspapers, books, book chapters, and PhD theses.

Investigations that were experimental or quasi-experimental were authorized—eliminated articles with a theoretical or introspective bent from consideration. Narrow down this topic to include only research that explicitly uses educational gamification techniques. Instructional video games and escape rooms are excluded from this list of studies since they are classified as "other recreational techniques" by the National Institutes of Health.

Eighty-two studies were identified and considered thirty after meeting the exclusion criteria mentioned above. The results of the extensive review are discussed as follows.

5   Discussion

This study aims to look at gamification systems at various levels of formal schooling to determine their effectiveness. Thorough research of educational gamification programs will benefit both professional instructors who use these approaches and the scientific community that publishes its results. Data suggests that gamification has a favorable impact on student's motivation, engagement, and academic achievement at all educational levels, regardless of their age or educational background. These findings suggest that educational gamification may be a helpful teaching technique in some situations.

Game-based learning has lately gained popularity in the educational setting, and it is expected to continue to do so in the future [8]. Gamification is becoming increasingly popular in educational environments. In education, gamification can take place in several different scenarios. According to the statistics, there is a growing interest in university education, focusing on student success than ever before. The integration of gamification with other instructional methodologies, such as project-based learning [9] and gamification in online learning environments [21], may also be investigated in educational gamification research. Students' and instructors' attitudes toward sustainability are shown to improve by Nurmi et al. [18], who demonstrate that educational gamification enhances student and teacher attitudes toward sustainability. According to the authors, teacher training is essential, ensuring that instructors are familiar with the approach and how to utilize it in the classroom and developing lesson plans that incorporate games and game features appropriate for the classroom environment.

It has been suggested that clever techniques may be directly tied to the emotional component, increasing public social awareness, and fostering emotional connections.

Thereby signaling a shift in pro-environmental behavior [26]. Gamification in the classroom may be a valuable method for long-term learning since it encourages students to actively participate in their education rather than passively listening to lectures about environmental problems. These findings are consistent with the results of one of the publications reviewed [20].

It states that educational gamification has positive repercussions for ethical training since it was fun. It is important to emphasize that while the usage of gamification tactics in these settings is expected to grow, students should have the ability to opt-out of the process if they so want, ensuring that the process is entirely voluntary and driven by their intrinsic desire. Additionally, it is vital to look at other potential uses of gamification in the educational setting.

The most important criteria to consider in this study, according to the findings, are motivation. The magnitude of the research evaluated shows that gamified tactics can increase student engagement and retention. The usage of badges was the sole method used in these trials to increase extrinsic motivation, which is notable. It has been shown that when learners are only awarded medals, their innate drive is suppressed, and they labor purely for the medals [21]. An attractive and engaging approach to education, in general, had been taken [8].

Gamification may be used to educate and strengthen curricular material and competencies. A standard indicator in educational gamification research is an academic accomplishment, which is also commonly employed.

According to the findings of a recent study, educational gamification has been shown to students' academic progress. Students are more motivated to study a subject in a classroom flow that has improved. Teaching methods have evolved to allow students to learn through challenges and significant tasks rather than the traditional one-way transmission of information. Regardless of their academic ability, they are more likely to complete exercises if provided with an entertaining story to read through before beginning them. It should also investigate the impact of gamification on disturbance and absenteeism in the classroom.

Due to the well-balanced design of the many components of gamification, it is thought that increased student interest and engagement will be possible in the classroom mechanics–dynamics–aesthetics (MDA). The most evaluated studies negatively impacted students using the PBL triangle (Points–Badges–Leaderboards) in most studies being assessed.

Though other studies altered their application, which may favor relying solely on extrinsic motivation, which eventually has a detrimental effect on students' intrinsic motivation [28], while PBL is very simple to implement. It is vital to proceed to more intricate gamification designs that include different dynamics, mechanics, and aesthetics that work as reinforcing factors for students' intrinsic drives rather than relying just on the simple mechanics of PBL. "An atmosphere with clear objectives…difficult work and realistic tales in which team spirit is maintained through games, chats, and mechanical arguments" is essential for improving motivation, as is keeping an eye on the surrounding environment and paying attention to design. Our research has provided our research to improve student performance by creating a gamified environment that includes a diverse range of mechanics, dynamics, and aesthetic aspects. The notion of player kinds may have a role in this. Establishing a rapport with the students, discovering what games they enjoy playing, and observing how they engage with one another are essential for building an engaging educational gamification program and delivering a compelling MDA.

Following this investigation, the most significant ramifications of gamification in education are highlighted. The first advantage that gamification provides to students is an enjoyable learning method. In the classroom, gamification can aid pupils who lack motivation and who are failing academically. Due to the variety of difficulties and rewards that gaming aspects bring, including gaming features in the classroom may motivate youngsters. According to the study's findings, students enrolled in educational gamification courses are more engaged and participative than students enrolled in regular classrooms in general.

6   Conclusion

It has been demonstrated that comprehensive literature reviews benefit social science research. One of the most distinguishing qualities of the systematic review approach is its willingness to accept criticism and transparent operations. As with any research procedure, there are inherent limits to both the methodology and the implementation of the study. This review is not without its limitations, though. Included peer-reviewed academic experiments in this analysis; no other types of research, such as those found in gray literature or book excerpts, were considered in this study. As a result, we feel this is realistic given the number of analyzed papers (33 articles reviewed in full text).

Furthermore, only publications published in English were included in the evaluation, removing potentially relevant items from consideration. As a result, there was the risk of publication bias in the systematic review. As a result of these limitations, the study results cannot be expanded upon in-depth. Although this analysis is limited in scope, its significance lies in compelling an extensive body of data demonstrating the usefulness of educational gamification in a formal educational context, emphasizing the specific characteristics of gamification employed in each example.

7   Way Forward

The primary goal of this research was to acquire a better grasp of the concept of educational gamification. According to the findings of a comprehensive research study, gamification can be advantageous at all academic levels, from elementary school to college. Under systematic research, gamified learning can increase students' motivation, engagement their intellectual accomplishment. Furthermore, the results of this poll revealed that points, medals, and rankings are the most often employed gamification features in educational settings. Using simply one or two game-like qualities like points or badges, the effects on student motivation may be minor, if not detrimental, depending on the situation. According to this research, a gamified environment that is diverse and personalized to the player's preferences is more motivating, may match the player's demands based on their player profiles, and is more likely to meet their needs. This project aims to further theoretical and experimental efforts to assess and develop pleasurable learning techniques that will improve the overall quality of education in the classroom setting.

We will examine several mechanics to identify how many most successfully use educational games at various levels of formal education. These mechanics and dynamics will vary depending on students and their training requirements.

References

1. Alsawaier RS (2018) The effect of gamification on motivation and engagement. Int J Inform Learn Technol 35(1):56–79. https://doi.org/10.1108/ijilt-02-2017-0009
2. Buckley P, Doyle E (2014) Gamification and student motivation. Interact Learn Environ 24(6):1162–1175. https://doi.org/10.1080/10494820.2014.964263
3. Black AE, Deci EL (2000) The effects of instructors' autonomy support and students' autonomous motivation on learning organic chemistry: a self-determination theory perspective. Sci Educ 84(6):740–756
4. Campillo-Ferrer JM, Miralles-Martínez P, Sánchez-Ibáñez R (2020) Gamification in higher education: impact on student motivation and the acquisition of social and civic key competencies. Sustainability 12(12):4822. https://doi.org/10.3390/su12124822
5. Dias J (2017) Teaching operations research to undergraduate management students: the role of gamification. Int J Manage Educ 15(1):98–111. https://doi.org/10.1016/j.ijme.2017.01.002
6. Díez Rioja JC, Bañeres Besora D, Serra Vizern M (2017) Experiencia de gamificación en Secundaria en el Aprendizaje de Sistemas Digitales. *Education in the Knowledge Society (EKS)*, *18*(2), 85–105. https://doi.org/10.14201/eks201718285105
7. Fischer C, Malycha CP, Schafmann E (2019) The Influence of intrinsic motivation and synergistic extrinsic motivators on creativity and innovation. Frontiers Psychol 10. https://doi.org/10.3389/fpsyg.2019.00137
8. Frick LT, de Souza DB (2014). Projetos bem-sucedidos em educação em valores: relatos de escolas públicas brasileiras. *Nuances: Estudos Sobre Educação*, *24*(3), 240–245. https://doi.org/10.14572/nuances.v24i3.2709
9. Floryan MR, Ritterband LM, Chow PI (2019) Principles of gamification for Internet interventions. Transl Behav Med 9(6):1131–1138. https://doi.org/10.1093/tbm/ibz041
10. Gatti L, Ulrich M, Seele P (2019) Education for sustainable development through business simulation games: an exploratory study of sustainability gamification and its effects on students' learning outcomes. J Clean Prod 207:667–678. https://doi.org/10.1016/j.jclepro.2018.09.130
11. Huang R, Ritzhaupt AD, Sommer M, Zhu J, Stephen A, Valle N, Hampton J, Li J (2020) A meta-analysis -the impact of gamification in educational settings on student learning outcomes: a meta-analysis. Educ Tech Res Dev 68(4):1875–1901. https://doi.org/10.1007/s11423-020-09807-z
12. Kindred J, Mohammed SN (2006) He will crush you like an Academic Ninja!: exploring teacher ratings on Ratemyprofessors.com. J Comput-Mediated Commun 10(3):00. https://doi.org/10.1111/j.1083-6101.2005.tb00257.x
13. Kyewski E, Krämer NC (2018) To gamify or not to gamify? An experimental field study of the influence of badges on motivation, activity, and performance in an online learning course. Comput Educ 118:25–37. https://doi.org/10.1016/j.compedu.2017.11.006
14. Mahmud SND, Husnin H, Tuan Soh TM (2020) I am teaching presence in online gamified education for sustainability learning. Sustainability 12(9):3801. https://doi.org/10.3390/su12093801
15. Macedo Reis H, de Sousa Borges S, Isotani S (2014). Análise de Usabilidade de Sistemas de Geometria Interativa para Tablets. *RENOTE*, *12*(1). https://doi.org/10.22456/1679-1916.50356
16. Mobasher M (2021) Earthquake in the city: using real-life gamification model for teaching professional commitment in high school students. J Med Ethics History Med. Published. https://doi.org/10.18502/jmehm.v14i1.5316
17. Manzano-León A, Camacho-Lazarraga P, Guerrero MA, Guerrero-Puerta L, Aguilar-Parra JM, Trigueros R, Alias A (2021) Between level up and game over: a systematic literature review of gamification in education. Sustainability 13(4):2247
18. Nurmi J, Knittle K, Ginchev T, Khattak F, Helf C, Zwickl P, Castellano-Tejedor C, Lusilla-Palacios P, Costa-Requena J, Ravaja N, Haukkala A (2020) Engaging users in the behavior change process with digitalized motivational interviewing and gamification: development and feasibility testing of the precious app. JMIR Mhealth Uhealth 8(1):e12884. https://doi.org/10.2196/12884

19. Ouariachi T, Li CY, Elving WJL (2020) Gamification approaches for education and engagement on pro-environmental behaviors: searching for best practices. Sustainability 12(11):4565. https://doi.org/10.3390/su12114565
20. Rozhenko OD, Darzhaniya AD, Bondar VV, Mirzoian MV (2021) Gamification of education as an addition to traditional educational technologies at the university. In: CEUR workshop proceedings, vol 2914, pp 457–464
21. Sailer M, Homner L (2019) The gamification of learning: a meta-analysis. Educ Psychol Rev 32(1):77–112. https://doi.org/10.1007/s10648-019-09498-w
22. Sipone S, Abella-García V, Barreda R, Rojo M (2019) Learning about sustainable mobility in primary schools from a playful perspective: a focus group approach. Sustainability 11(8):2387. https://doi.org/10.3390/su11082387
23. Santos-Villalba MJ, Leiva Olivencia JJ, Navas-Parejo MR, Benítez-Márquez MD (2020) Higher education students' assessments towards gamification and sustainability: a case study. Sustainability 12(20):8513. https://doi.org/10.3390/su12208513
24. Sezgin S, Yüzer TV (2020) Analyzing adaptive gamification design principles for online courses. Behav Inform Technol 1–17. https://doi.org/10.1080/0144929x.2020.1817559
25. Strahringer S (2015) Rezension "Gamification in education and business." HMD Praxis Der Wirtschaftsinformatik 52(6):928–930. https://doi.org/10.1365/s40702-015-0183-8
26. Swacha J (2021) State of research on gamification in education: a bibliometric survey. Educ Sci 11(2):69
27. Trigueros R, Aguilar-Parra JM, Lopez-Liria R, Cangas AJ, González JJ, ÁLvarez JF (2020) The role of perception of support in the classroom on the students' motivation and emotions: the impact on metacognition strategies and academic performance in math and English classes. Frontiers Psychol 10. https://doi.org/10.3389/fpsyg.2019.02794
28. Tsai C, Lin H, Liu S (2019) The effect of the pedagogical GAME model on students' PISA scientific competencies. J Comput Assist Learn 36(3):359–369. https://doi.org/10.1111/jcal.12406
29. Thoemmes FJ, Kim ES (2011) A Systematic review of propensity score methods in the social sciences. Multivar Behav Res 46(1):90–118. https://doi.org/10.1080/00273171.2011.540475
30. Turan Z, Avinc Z, Kara K, Goktas Y (2016) Gamification and education: achievements, cognitive loads, and views of students. Int J Emerg Technol Learn (IJET) 11(07):64. https://doi.org/10.3991/ijet.v11i07.5455
31. Wu B (2019) Hierarchical macro strategy model for MOBA game AI. In: Proceedings of the AAAI conference on artificial intelligence, vol 33, pp 1206–1213. https://doi.org/10.1609/aaai.v33i01.33011206