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Gamification for Sustainable Educational Setting: A Recent Structured Review

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ABSTRACT

The integration of gamification in education garnered significant attention in recent years to engage learners and enhance their learning experiences innovatively. This structured review aims to analyse the existing literature on the topic, to understand the diverse applications of gamification in education, from elementary to higher levels, fostering effective and engaging learning experiences in sustaining educational settings. By analysing a variety of the most recent three years of empirical data (n=23) from Mendeley and Eric database, using a method of Prisma Technique, this review offers insights into the impacts of gamification on learner motivation, academic performance, and overall learning outcomes. The review systematically tailored various gamification in education settings into different age groups, and clarifies through analysis of both benefits and potential problems faced. Key finding reveals that gamification has the potential to sustain the learner engagement and motivation regardless their ages and educational level. The successful gamification implementation requires careful consideration of factors like curriculum alignment, and motivational aspects to engage the learners in achieving the learning goals that being arranged. In conclusion, this structured review provides educators, researchers, and policymakers with a comprehensive overview of the current landscape of gamification in for sustainable education. By offering a distinct understanding of its benefits and limitations, this evaluation helps decision-makers make well-informed choices about the incorporation of gamified approaches into contemporary educational practices.

1. Introduction

The advancement of Information and Communication Technology (ICT) has altered every aspect of our lifestyle and society. Looking at perspective of educational setting, e-learning is introduced to offer an alternative that the traditional system was unable to provide, notably having the ability to learn from anywhere at any time. E-learning extends the limits of traditional classrooms and allows learners to connect with tutors and classmates all around the world. However, e-learning could be

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felt monotonous the same way the conventional learning takes place, hence numerous studies are conducted to determine the most effective methods for creating a more enjoyable and engaging learning experience among the learners. Gamification in educational setting is an approach that uses games to support learners learn. Just like how playing games can be fun and engaging, gamification makes learning more enjoyable by turning educational content into games. This way, learner can enjoy themselves while learning new things and refining vital skills to enhance learning outcomes and engage learners into the curriculum.

There are few key concepts and developments concerning gamification in educational setting, including motivation and engagement, active learning, skill development, educator facilitation, prompt feedback, differentiated learning and assessment methods [1]. The most digital game elements that frequently used in current game-based educational setting are presented in Figure 1.

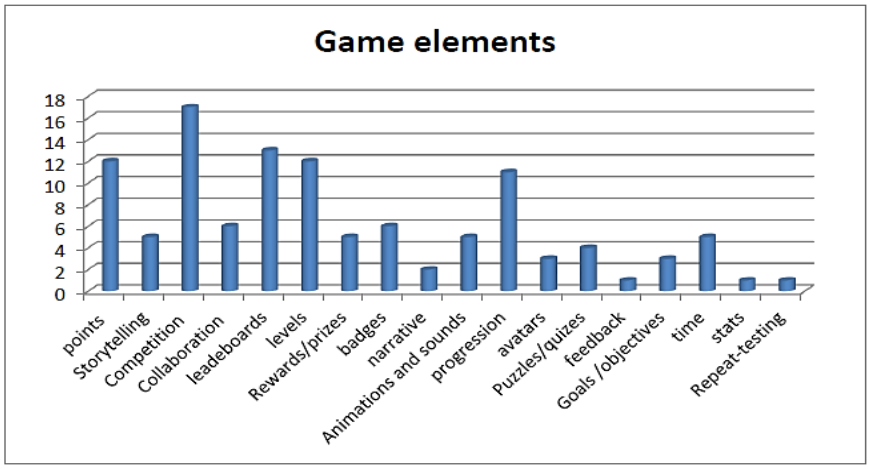


Fig. 1. Frequently used game elements in educational setting [2]

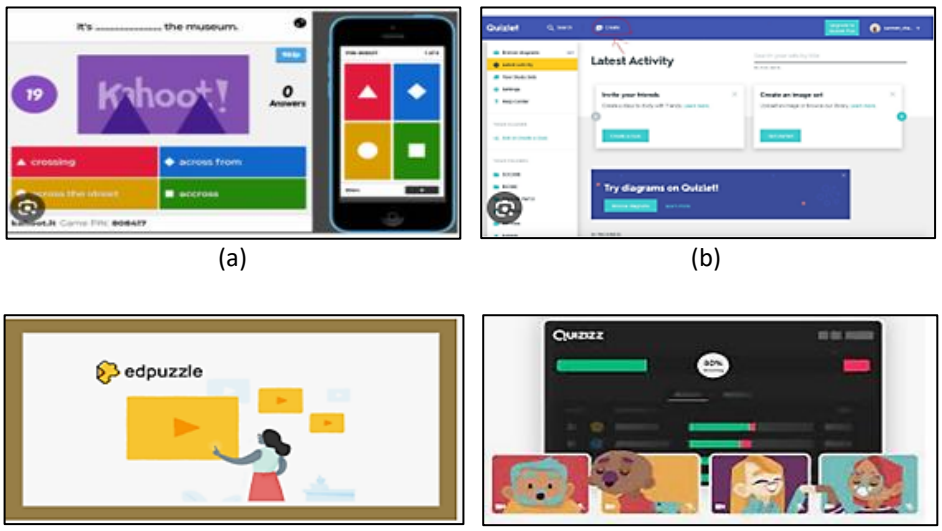
Gamification success depends on careful planning and alignment with learning goals. It is crucial to find a balance between instructional value and learners' engagement. The principal idea behind gamification is that educational settings may benefit from the motivating appeal of game components. A relationship between game aspects and learning outcomes has been suggested by several research because of the importance of game features in a gamified environment and proven of the varying outcomes in an educational context [3,4].

Gaming elements are core parts of gamification generally integrated representing educational contents or activities, whether digitally or not. Lately, gamification has focused to engage learners, utilizing electronic gadgets hardware and applications for interactive game-play mechanics and aesthetically motivating learners to immerse with learning process. Moreover, as mentioned by García-López *et al.*, [5] digital gamification has tremendous potential in using specific Internet tools such as cookies for real-time tracing of points and activities done by learners. Table 1 illustrates the elements of game-based learning that incorporated into educational setting regardless the level of study.

Gamification is an approach that leverages the principles of gaming to enhance learning experiences across all age groups. For children, it offers engaging and interactive educational games that make learning fun while reinforcing important skills [6]. Figure 2 illustrates the study by Munuyandi *et al.,* [7], the top 4 extensively searched game-based teaching online platforms targeted for young learners among Malaysian educators.

Table 1
Game-based learning in educational setting [8,9]

Gaming elements	Learning result	Motivational engagement
Points/badges	Students earn points or badges for completing assignments, or achieving certain target achievements.	Serve as a sense of accomplishment and motivate learners to stay engaged in learning.
Leaderboards	Leaderboards are created by game to show learners' progress and ranking in each level of activities.	Fosters healthy competition and encourages learners to strive for the top spot.
Quests and missions	Learning is developed as a series of mission or quest to be accomplished.	Each completed task takes learners nearer to completing the overall mission, making the learning adventurous.
Interactive quizzes and challenges	Quizzes and test are presented in games approach with interactive multimedia elements.	Immediate feedback and rewards for correct answers can enhance the learning experience
Simulation games	The simulation of virtual scenario impersonating real-life situations.	History class for example might use a simulation game where learners take on roles of historical figures and make decisions based on historical context.
Storytelling and narrative	Featuring storytelling elements into lessons to create engaging context for learning.	Learners to keep trail of storyline as they progress through the lesson.
Collaborative games	These require team of learners to work together towards a common goal.	Learners work together to achieve goals, fostering communication and cooperation skills.



(a) (b) (c) (d)

Fig. 2. Most search online gamification platform for young learners in Malaysia (a) Kahoot! (b) Quizlet (c) Edpuzzle (d) Quizziz [9]

For teenagers or high school students, the gamification introduces gamified elements that promote critical thinking, problem-solving, and collaboration, often through immersive simulations or educational video games. For adults, gamification can provide a dynamic way to acquire new skills, ranging from professional development through gamified training modules to lifelong learning through educational games that cater to diverse interests and goals [10]. Overall, gamification tailors

learning experiences to suit the needs and preferences of learners at different stages of life, fostering motivation, retention, and a deeper understanding of the subject matter [11].

Gamification has emerged as a promising approach to enhance learner engagement and motivation across educational contexts. This systematic literature review aims to consolidate recent research on the application of gamification in education, focusing on the underlying purposes and motivations driving its implementation. The review also explores the various gamification methods utilized to cater learners across a broad spectrum, from primary schools to university levels. By analyzing these studies, the review intends to shed light on the effectiveness and adaptability of gamification techniques across diverse learning environments.

2. Methodology

2.1 Literature Identification

This study adapts the systematic review technique that consists of four main stages to filter and find relevant publications for this investigation (see Figure 3). The first stage, begins with the selection of keywords and the search for related terms, which are then related to past studies. Next is generation of all relevant phrases of the search strings derived in databases Scopus and Eric (see Table 2). At initial stage, the result successfully retrieved 245 related articles from both databases.

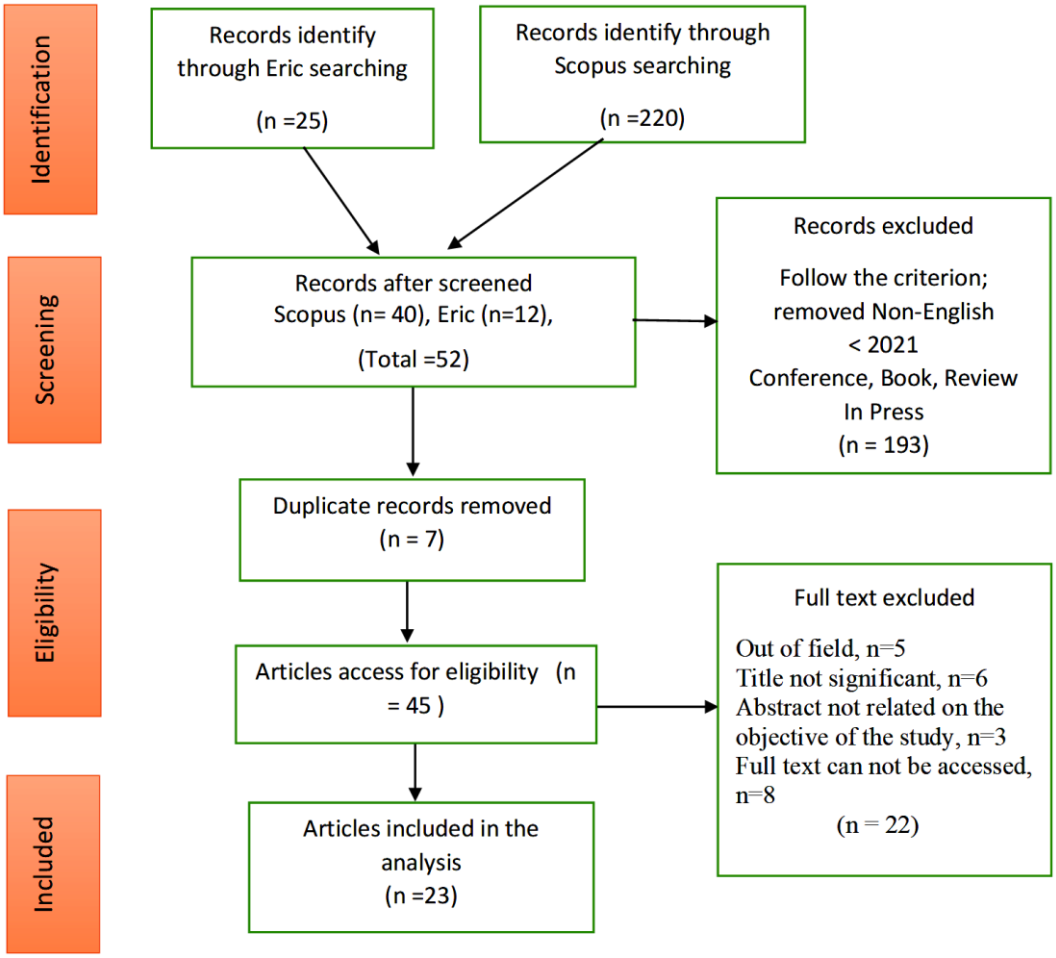


Fig. 3. Flow diagram of the proposed searching study [12]

Table 2
The search strings

Scopus	TITLE-ABS-KEY (gamifi* OR "game based" OR "game-based" AND learner* AND student* AND engage* AND motivation*) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2023)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English"))
Eric	gamification OR game-based AND learner* AND student* AND engage* AND motivation*(Topic) and 2023 or 2022 or 2021 (Publication Years) and Article (Document Types) and English (Languages)

2.2 Literature Screening

The screening procedure involves filtering out a wide range of unlikely resources for content that is inconsistent to the focus of study. At this stage, a number of articles are eliminated based range of inclusion and exclusion criteria (see Table 3), with 193 studies were screened-out and leaving 52 articles to be evaluated. It should be mentioned that the primary inclusion criteria were only articles from type of journal study. Resources such as study reports, book reviews, meta-syntheses/analyses, books, book series, chapter abstracts, and conference proceedings were being excluded**.** Furthermore, only English-language articles were taken into consideration, with the recent three years being published, which is within the range of 2021 until 2023. Finally, seven articles were found to be duplicated and also being eliminated, hence assigning only 45 articles as the primary source of practical references.

Table 3
The selection criterion

Criterion	Inclusion	Exclusion
Language	English	Non-English
Time line	2021-2023	< 2021
Literature type	Journal (article)	Conference, book, review
Publication stage	Final	In press

2.3 Eligibility

For the third stage, known as eligibility, a total of 45 articles have been ready. All articles' title and key subjects were thoroughly reviewed at this stage to ensure that the inclusion requirements were fulfilled and fit into the present study. Therefore, 22 articles were omitted because they were out of field, title not significant, abstract not related to the objective of the study, and the full text cannot be accessed. The conference articles were omitted because of there might undergo less stringent peer-review compared to journal articles. This could cast uncertainty on the methodological objectivity and general calibre of the research reported, which could affect the validity and dependability of the conclusions in this study. Hence, there were 23 articles available for review based on empirical evidence.

2.4 Data Abstraction and Inclusion

This study utilized an integrative analysis as one of the assessment procedures to investigate and synthesize multiple research designs namely the qualitative, the quantitative, and the mixed methodologies. Expert studies were thoroughly examined to derive the appropriate contents and its sub-topics. There were 23 articles been analytically reviewed for assertions or information

addressing the current scenarios in gamification in education. Correspondingly, the authors evaluate every article and conclude the themes arise. As a result, subthemes of learners' age or level of educational background to be tailored with gamification methods and motivational outcomes are the key topics that emerged from the analysis.

Next, the authors resume to each previously established subthemes, as well as its any related subjects, conceptions, or ideas within the context of this study. A log was created throughout analysis process to capture opinions, outcomes or other ideas relevant to articles interpretation. If there were any anomalies in the subtheme, the authors carefully compared the disparities across subjects. As a result, the developed concepts were modified to make sure there are coherence and related to each other. The subject matter experts in educational practice from Kolej Universiti Islam Perlis (KUIPs) were referred to guarantee the legitimacy of the issues being investigated. The experts confirmed the clarity, importance, and appropriateness of each sub-theme within its domain of study.

3. Results

In today educational setting, one of the strategies that has received attention is the use of gamification. It is believed that by implementing games in learning can encourage students or learners to be more motivated and actively participate throughout the teaching and learning process [13,14].

3.1 Gamification Strategies for Diverse Learners

Game-based education is a novel and effective way to impart knowledge that uses game design and gameplay concepts to captivate learners and promote learning. Implementing game-based teaching might differ depending on the learners' age and educational level. Here are some analyses throughout 23 articles providing broad principles for integrating game-based learning at various levels and ages (See Table 4). It can be concluded that gamification in the literatures tailored for university students counting six (6), high-school/teenagers category is nine (9), and primary/elementary level is eight (8), with various topics from sciences to arts had been delivered with multiple gamification elements approach.

Table 4
Gamification strategies for diverse learners

No	Authors	Year	Title	Game elements	Learners' category
1	Ross and Bennett [14]	2022	"Increasing Engagement with Engineering Escape Rooms"	Escape rooms-presented in four sets of puzzles.	University students studying engineering
2	Abu-Hammad and Hamtini [15]	2023	"A Gamification Approach for Making Online Education as Effective as In-Person Education in Learning Programming Concepts"	Leaderboards, and points.	High school students studying computer programming
3	Manzano *et al.,* [16]	2023	"Gamification in Science Education: Challenging Disengagement in Socially Deprived Communities"	Not specified.	High school students from socially disadvantages community

Table 4
Gamification strategies for diverse learners

No	Authors	Year	Title	Game elements	Learners' category
4	Bang and Flynn [8]	2023	"Efficacy of an Adaptive Game-Based Math Learning App to Support Personalized Learning and Improve Early Elementary School Students' Learning"	Collaborative games, and points/badges.	Elementary school students studying Mathematics
5	Kaldarova *et al.,* [17]	2023	"Applying Game-Based Learning to a Primary School Class in Computer Science Terminology Learning"	Interactive quizzes and challenges, and simulation games.	Primary school students studying computer science
6	Giraldo *et al.,* [18]	2022	"Development, Application, And Evaluation of an Online Competitive Simulation Game for Teaching Electricity Markets"	Simulation game	University students at Master program studying electricity
7	Baiden *et al.,* [19]	2022	"The Effect of Gamification on Home Economics Students' Motivation and Engagement in Drawing Activities"	Storytelling and narrative	Senior high school students studying drawing skills
8	Chans and Portuguez [20]	2021	"Gamification as a Strategy to Increase Motivation and Engagement in Higher Education Chemistry Students"	Points/badges	University students studying chemistry
9	Chen *et al.,* [21]	2023	"The Study on The Effects of Gamified Interactive E-Books on Students' Learning Achievements and Motivation in A Chinese Character Learning Flipped Classroom"	Not specified but approach use a gamified interactive e-book	Primary school students learning Chinese characters
10	Nuci [22]	2021	"Game-Based Digital Quiz as a Tool for Improving Students' Engagement and Learning in Online Lectures"	Digital quiz with points/batches (Kahoot!)	University students
11	Ng *et al.,* [23]	2023	"Evaluating TESLA-G, A Gamified, Telegram-Delivered, Quizzing Platform for Surgical Education in Medical Students: Protocol for a Pilot Randomised Controlled Trial"	Not specified but elements of Bloom's Taxonomy pedagogy were emphasized	Undergraduate university medical students
12	Leitão *et al.,* [24]	2022	"Ocean Literacy Gamified: A Systematic Evaluation of The Effect of Game	Multiple game elements	Secondary school students (age 11-14y) studying ocean literacy

Table 4
Gamification strategies for diverse learners

No	Authors	Year	Title	Game elements	Learners' category
			Elements on Students' Learning Experience".		
13	Lin *et al.,* [25]	2021	"Effects of Incorporating Augmented Reality into A Board Game for High School Students' Learning Motivation and Acceptance in Health Education".	Leaderboard game assimilating augmented reality (AR).	High school students.
14	Alajaji and Alshwiah [26]	2021	"Effect of Combining Gamification and A Scavenger Hunt on Pre-Service Teachers' Perceptions and Achievement".	Combined game elements via e-quizzing tools with the main principles of a scavenger hunt (SH)-collaboration.	School of education university students.
15	Breien *et al.,* [27]	2022	"The Eluna Mixed-Reality Visual Language for Co-Design of Narrative Game-Based Learning Trails".	Simulation game.	Junior and high school students.
16	Hamdaoui *et al.,* [28]	2021	"Learner Modelling in Educational Games Based on Fuzzy Logic and Gameplay Data".	Simulation game, storytelling, point rewards.	High school students.
17	Lavoué *et al.,* [29]	2022	"Analysing the Relationships Between Learners' Motivation and Observable Engaged Behaviours in a Gamified Learning Environment".	Not specified.	13–14-year-old school students.
18	Zafeiropoulou *et al.,* [30]	2021	"Developing Physics Experiments Using Augmented Reality Game-Based Learning Approach: A Pilot Study in Primary School".	Treasure hunt game, simulation, points/prizes.	Primary schools studying physics.
19	Mårell [31]	2022	"Teachers' Perception of Gamification as a Teaching Design".	Not specified.	K-12 school students.
20	Zourmpakis *et al.,* [32]	2023	"Adaptive Gamification in Science Education: An Analysis of The Impact of Implementation and Adapted Game Elements on Students' Motivation".	Multiple game elements.	School students studying science.
21	Yang *et al.,* [33]	2022	"Promoting Students' Math Learning Performance and Engagement: A Help-seeking Mechanism-based Mobile Gaming Approach".	Collaborative and interactive competition.	Elementary school students.

Table 4
Gamification strategies for diverse learners

No	Authors	Year	Title	Game elements	Learners' category
22	Huraj *et al.,* [34]	2022	"The Impact of a Digital Escape Room Focused on HTML and Computer Networks on Vocational High School Students".	Escape room with collaborative and cooperative activities.	Vocational high school students.
23	Abdul *et al.,* [35]	2022	"Motivation, Engagement, Enjoyment, and Learning Achievement Toward Gamified Classroom via Learning Management System to Enhance Learning Attitude".	Challenges, collaborative team, and leaderboard.	University postgrad students.

From the analysis in Table 4, gamification is essentially a flexible tool that works well for all kinds of learning environments. Gamification produces engaging learning experiences that appeal with learners at every step, from laying the groundwork in elementary school to addressing complexities in middle and high school, and getting ready for real-world application in higher education. Educators may give learners of all ages an engaging and dynamic learning experience by utilizing the motivational potential of games.

3.2 Game Elements & Methods Used, and Motivational Outcomes

When implementing game-based education at any level, it is essential to align the games with learning objectives, provide clear instructions, offer feedback and assessment, and ensure accessibility for all students or learners. Thus, the authors conducted the analysis throughout 23 articles to portray the relationships on how game elements and methods in education can be used strategically to foster motivation, engagement, and active learning as depicted in Table 5.

Table 5
Game elements, methods and motivational outcomes

No	Authors/year	Title	Methods	Motivational outcomes
1	Ross and Bennett (2022) [14]	"Increasing Engagement with Engineering Escape Rooms".	Deploy an escape room concept with sets of puzzles in engineering study environment using a physical hardware tool.	Report of acceptable engagement and motivation of learners' activity.
2	Abu and Hamtini (2023) [15]	"A Gamification Approach for Making Online Education as Effective as In-Person Education in Learning Programming Concepts".	An experiment was carried out by splitting learners in a programming class into two groups: the first is learners' study in the usual classroom setting. The next group is the gamification-based group in a developed gamification platform.	High level of motivation among group with gamified elements in learning computer programming.
3	Manzano *et al.,* (2023) [16]	"Gamification in Science Education: Challenging Disengagement in Socially Deprived Communities".	A quantitative comparison of pretest-posttest measures with the test (gamified) and control groups (traditional) was performed.	The test group greatly outperformed the control group in terms of direction, engagement, and motivation.

Table 5
Game elements, methods and motivational outcomes

No	Authors/year	Title	Methods	Motivational outcomes
4	Bang *et al.,* (2023) [8]	"Efficacy of an Adaptive Game-Based Math Learning App to Support Personalized Learning and Improve Early Elementary School Students' Learning".	Using the gamified apps namely My Math Academy to test students with 2 groups-treatment and control.	The app proven as beneficial learning tool that enhanced and boost students' engagement, motivation, and confidence in math learning.
5	Kaldarova *et al.,* [17]	"Applying Game-Based Learning to a Primary School Class in Computer Science Terminology Learning".	Two measurements were used to identify the values of game-based learning. The first is a questionnaire that students filled out in three categories: Impression, Usability, and User Interface. The downloading and uploading of home-tasks, as well as academic performance, is the second component of measurement.	90% of students claimed game-based learning was useful for their academics and memorizing computer science terms.
6	Giraldo *et al.,* (2022) [18]	"Development, Application, And Evaluation of An Online Competitive Simulation Game for Teaching Electricity Markets".	An online asynchronous mode simulation game, was used to teach electrical principles, followed by survey questions to inquire about experience production, conceptual comprehension, skill improvement, and affective assessment.	Students were enthusiastic about the platform's capabilities. The biggest concerns from students were a lack of programming competence and a lack of time allotted during the course.
7	Baiden *et al.,* (2022) [19]	"The Effect of Gamification on Home Economics Students' Motivation and Engagement in Drawing Activities".	A quasi-experimental game-based design was deployed within a traditional lecture (hybrid technique), and data was collected using a questionnaire.	The use of gamification inspired respondents' interest in drawing, engaging and encouraging them to improve their drawing abilities.
8	Chans and Portuguez (2021) [20]	"Gamification As a Strategy to Increase Motivation and Engagement in Higher Education Chemistry Students".	The concept explains the short, medium, and long-term rewards that inspired and motivated pupils to achieve certain goals.	According to the quantitative data, students considered how gamification may improve motivation and engagement in chemistry study.
9	Chen *et al.,* (2023) [21]	"The Study on The Effects of Gamified Interactive E-Books on Students' Learning Achievements and Motivation in A Chinese Character Learning Flipped Classroom".	Using the gamified flipped interactive e-book to test learners in treatment and control groups.	The findings of the investigation demonstrated that gamified interactive e-books boost learning.
10	Nuci *et al.,* (2021) [22]	"Game-Based Digital Quiz as A Tool for Improving Students' Engagement and	Two motivational traits are contrasted and studied using two separate online quiz systems, with the learning curve illustrating the	The results showed that online quizzes increased students' involvement and

Table 5
Game elements, methods and motivational outcomes

No	Authors/year	Title	Methods	Motivational outcomes
		Learning in Online Lectures".	consequences of how they are used.	interaction levels in lectures significantly.
11	Ng *et al.,* (2023) [23]	"Evaluating TESLA-G, A Gamified, Telegram-Delivered, Quizzing Platform for Surgical Education in Medical Students: Protocol for A Pilot Randomised Controlled trial".	The endocrinology surgery topic receives five randomized questions, with each question matching to one level on Bloom's taxonomy.	This design encourages mastery while increasing student engagement and motivation.
12	Leitão *et al.,* (2022) [24]	"Ocean Literacy Gamified: A Systematic Evaluation of The Effect of Game Elements on Students' Learning Experience"	To examine students' motivation, a pre-test and post-test using a recycled situational motivation survey were administered in a classroom context.	The findings indicate a trend in the influence of game components on the most distinct forms of motivation.
13	Lin *et al.,* (2021) [25]	"Effects of Incorporating Augmented Reality into A Board Game for High School Students' Learning Motivation and Acceptance in Health Education"	To assess the outcome, the instructional material motivation survey and the technology acceptance model are used on the experimental and control groups.	The results had a substantial impact on acceptability, and the incorporation of AR into the leaderboard game had a significant impact on learning motivation.
14	Alajaji and Alshwiah (2021) [26]	"Effect of Combining Gamification and A Scavenger Hunt on Pre-Service Teachers' Perceptions and Achievement".	A teaching technique is proposed that integrates gamification components through e-quizzing tools with the core concepts of collaborative assignments through a treasure hunt.	The findings have been found to enhance trainee instructors' opinions of the chosen teaching approach. It also enhanced students' willingness to learn and participation with their peers.
15	Breien *et al.,* (2002) [27]	"The Eluna Mixed-Reality Visual Language for Co-Design of Narrative Game-based Learning Trails".	The conceptual framework includes a co-design process and a visual language that emphasizes mixed reality, connecting actual exhibits into virtual stories via the use of sensors and control assignments.	Learning trails using mixed-reality narrative games encourage learners to take initiative and have a beneficial impact on motivation, engagement, and learning.
16	Hamdaoui *et al.,* (2021) [28]	"Learner Modelling in Educational Games Based on Fuzzy Logic and Gameplay Data".	A fuzzy logic-based modelling method that forecasts learners' preferred learning and playing modes using expert rules and gaming data.	The approach demonstrated capability to improve student motivation, engagement, and provision of individualized and flexible learning.
17	Lavoué *et al.,* (2021) [29]	"Analysing the Relationships Between Learners' Motivation and Observable Engaged Behaviours in	The complex interactions between learners' motivation and engagement with a model of engagement that separates engaged behaviours into two	Perceives on motivating opportunities, as well as the creation and dynamic modification of gamification

Table 5
Game elements, methods and motivational outcomes

No	Authors/year	Title	Methods	Motivational outcomes
		A Gamified Learning Environment".	categories: perfection-oriented engagement for low achiever learners and achievement-oriented engagement for high achiever learners.	depending on how students engage with the classroom.
18	Zafeiropoulou *et al.,* (2021) [30]	"Developing Physics Experiments Using Augmented Reality Game-Based Learning Approach: A Pilot Study in Primary School".	Utilized an augmented reality (AR) to engage students with a virtual environment and manage virtual objects. Students must follow the flow to gather all of the materials to execute the experiment.	The results indicate the approach improves student interest and engagement, which in turn improves the learning process by teaching experiments in physics more effectively.
19	Mårell (2022) [31]	"Teachers' Perception of Gamification as a Teaching Design".	Focusing topics related to (a) encouraging motivation and teamwork, (b) the importance of pedagogical balance for deeper learning, and (c) organizational adjustments for teachers' time management and cooperation.	Teachers defined gamification as a chance and a spark to get students excited about learning and involved in their coursework. Lack of experience and time to create and implement gamification are obstacles.
20	Zourmpakis *et al.,* (2023) [32]	"Adaptive Gamification in Science Education: An Analysis of the Impact of Implementation and Adapted Game Elements on Students' Motivation".	To comprehend how each aspect of the game that the students encountered affected their motivation by incorporating adaptive criteria and learning strategies over aspects of science education.	The adaptive criteria were mainly successful, as students generally appreciated the game aspects included into their courses, demonstrating the effectiveness of the multifaceted framework in increasing students' involvement and experiences.
21	Yang *et al.,* (2022) [33]	"Promoting Students' Math Learning Performance and Engagement: A Help-seeking Mechanism-based Mobile Gaming Approach".	A group of learners was allocated to the control group, which used the conventional mobile gaming technique, while the other was assigned to the experimental group, which used the interactive mobile math game with the help-seeking mechanism.	The suggested approach successfully increased student motivation and academic success. An further examination of the trial data revealed that students with low mathematics self-efficacy benefitted more from the suggested strategy than did students with strong self-efficacy.
22	Huraj *et al.,* (2022) [34]	"The Impact of a Digital Escape Room Focused on HTML and Computer Networks on Vocational High School Students".	Implementation an escape room based on HTML to assess the students' levels of perception of the game.	The study makes sense of and validates the inference to utilize a virtual educational escape room is fun for students and fosters teamwork and problem-solving skills.

Table 5
Game elements, methods and motivational outcomes

No	Authors/year	Title	Methods	Motivational outcomes
23	Abdul *et al.,* (2022) [35]	"Motivation, Engagement, Enjoyment, and Learning Achievement Toward Gamified Classroom via Learning Management System to Enhance Learning Attitude".	A case study research approach was used to examine students' motivation, engagement, enjoyment, and learning accomplishment in addition to their scoring and engagement profile through the Schoology platform, utilizing focus groups, data logs, and questionnaires.	Participants said that the gamified classroom method had enhanced their learning and perspectives of gamification, and they liked solving challenges.

By incorporating various game elements and methods in the lesson as depicted in Table 5, it created dynamic and effective learning environments alluring learners via followings that lead to improved outcomes towards positive educational goals:

i. Well-defined goals, rewarding systems, and prompt feedback provide a meaningful learning environment.
ii. Incorporating challenges with increasing difficulty levels maintains engagement and fosters sense of accomplishment for learners.
iii. Immersive and enjoyable learning journey can be developed via storytelling approach, along with competition and collaborative elements.
iv. A dynamic and customized learning pace is ensured by giving learners choices and autonomy, simulating real-world applications, and incorporating social interaction.

However, there were some methodological flaws that raised from few studies that been identified, and were presented in the Table 6.

Table 6
Methodological flaws from reviewed articles

Methodological flaw	Description	Identified articles
Lack of control group	Studies that neglect to include a control group, to isolate the true impact of gamification versus other factors influencing learning.	[14,17-20,34]
Short duration	Studies that implemented for brief periods, limiting the ability to assess long-term effects on learning, motivation, and behaviour change. It is recommended the study at least to be conducted at minimum of one academic term or semester which is corresponding to 3 months and more [36].	All
Small sample size	Studies with limited participant numbers and focusing on specific sample might not provide enough statistical power to detect significant effects or generalize findings to larger populations.	All
Ignoring individual differences	Gamification designs may not adequately account for individual differences in learning styles, preferences, and motivations, potentially leading to unequal engagement and outcomes for some learners.	Not specified except in [29,32,35]
Lack of theoretical grounding	Gamification implementations lack a strong theoretical foundation, making it difficult to understand the underlying mechanisms driving observed effects and to replicate successful interventions	Not specified

4. Conclusions

In conclusion, game-based education is versatile to learners of all ages, and it provides an immersive and effective method for acquiring knowledge and skills. The gamification also can be fitted in multiple fields of study namely arts, sciences, technologies, arithmetic, vocational practices, etc. It is necessary for educators and game designers to ensure the instructional games elements and methodologies used should correspond to the developmental stage and learning goals of the intended age group of learners.

Every educational setting has particular learning objectives. Learning objectives alignment in game-based learning is a critical aspect of designing effective educational games. Sustainable educational practice through gamification involves integrating game elements and principles into the educational process to make it more engaging, enjoyable, and effective. Designers of games and educators must collaborate to create game mechanics, content, and activities that should directly complement and reinforce the learning objectives that have been specified.

However, the current state of research also marked by several methodological limitations, that hinder the ability to establish clear causal relationships and generalize findings of gamification in educational settings. Future research should prioritize rigorous experimental designs with larger and more diverse samples, and longitudinal studies to capture long-term effects. Additionally, a greater emphasis on theoretical grounding, individual differences, and qualitative data will enhance the understanding of the complex dynamics of gamification in educational contexts.

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