The Impact of Gamification on Students' Learning Outcomes: A Literature Review on the Affective, Cognitive and Psychomotor Domains

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Abstract
The implementation of gamification has become a new trend in education by integrating technological advancement with game elements to enhance students' learning. Although a considerable number of literature reviews exist about gamification in educational contexts, few literature reviews have focused on analyzing the impacts of gamification on students' learning and outcomes. However, there is no such review study to analyze the comprehensive impact of gamification on students' learning outcomes by considering all the aspects of learning domains-cognitive, affective and psychomotor. This study is a review of forty (40) articles about the impact of gamification on students' learning published in seven major educational technology research journals from January 2015 to April 2024. The major findings of this review indicate a significant positive impact on students' learning outcomes in cognitive, affective and psychomotor domains. The strongest impact of gamification is made for learning outcomes in cognitive domain followed by psychomotor and affective domains. Moreover, the study identified several gaps in gamification literature. More longitudinal research is needed to analyze the long-term impact that gamification has made on students' learning outcomes. Moreover, researchers and designers of gamification interventions need to pay more attention for integrating game elements other than the most common game elements- points, badges or leaderboards. The contribution of this study will lead to a better understanding of the impacts of gamification on students' learning outcome from a broader view. Further, this study can be a valuable reference for educators and researchers working in the field of gamification.

Keywords: Gamification, Learning Outcomes, Learning Domains

Introduction

Technological advancements have undeniably permeated every aspect of modern life, offering innovative ways to carry out everyday tasks. These advancements have also revolutionized education by introducing dynamic and creative learning approaches tailored to diverse educational needs. The integration of digital technologies in teaching and learning has become a global trend, as traditional teaching methods lose appeal among younger generations (Szymkowiak et al., 2021). Furthermore, the current generation of learners, raised in a tech-driven environment, demands more advanced and engaging educational experiences (Szymkowiak et al., 2021). As a result, there is a need for implementing cutting-edge, interactive teaching strategies to foster effective learning environments.

Moreover, the shift from traditional teacher-centered learning to a student-centered learning model has become a prominent global trend in education (Diab & Sartawi, 2017). This approach prioritizes what students are expected to achieve or demonstrate at the end of the learning process (Ibid.). Educational digital games are emerging as a valuable tool within this student-focused framework, promoting the enhancement of knowledge and skills (Dicheva et al., 2015). Unlike conventional methods, these educational games actively engage learners, encouraging deeper interaction with the material. Digital games, among the diverse technologies available, stand out for their potential to develop multiple competencies simultaneously (Smith et al., 2022). Recognizing this potential, pedagogical strategies such as gamification have gained popularity, integrating game-based principles into educational practices to create engaging and innovative learning experiences.

Although gamification has become a popular educational strategy, there remains limited research that thoroughly examines its effects on students. As noted by Kalogiannakis et al. (2021), the influence of gamified approaches on learning outcomes is often debated due to insufficient empirical studies investigating their impact. Furthermore, there is a lack of comprehensive review which has been conducted to evaluate the effects of gamification on learning outcomes; cognitive, affective, and psychomotor domains. A review focusing on these domains would offer valuable insights to educators, instructional designers, researchers, and policymakers. Such findings could guide the creation of gamified learning environments that are more effective in achieving targeted learning objectives across the three domains.

Therefore, this review aims to fill that gap by synthesizing current literature on gamification and its effects on students' learning outcomes. The objectives include analyzing existing studies and investigating the significant impact of gamified interventions on learning outcomes. The review begins with an overview of gamification literature and a focus on cognitive, affective, and psychomotor domains. It then describes the criteria for study selection and analysis. Results are followed by concluding with the study's contributions, limitations, and suggestions for future research to develop effective gamified learning environments.

Literature Review

Gamification

Gamification, introduced over the past few decades, has garnered significant attention across various fields, including education (Sailer & Homner, 2020). While games primarily serve as entertainment, their versatility extends to areas like training and knowledge sharing (Richter,

2015). In education, gamification is defined as integrating game design elements, aesthetics, and mechanics into non-game contexts to enhance motivation and engagement (Alsawaier, 2019). Widely, it refers to applying game design components in non-gaming settings to improve user experience and engagement (Deterding et al., 2011). In essence, gamification in education aims to boost student engagement and learning by incorporating game elements into educational environments (Dichev & Dicheva, 2017).

Educational gamification can be categorized into 'Basic' and 'Complex' types. Basic gamification involves adding simple game elements to existing content, while complex gamification requires advanced programming to create sophisticated systems (Lazar, 2015). Despite similarities, gamification differs from terms like serious games or game-based learning, as it focuses on designing learning approaches with game elements rather than fully integrating games into education (Pukelis, 2009). Its primary goal is to influence behavior and attitudes that indirectly lead to improved learning outcomes (Mulcahy et al., 2021). However, the success of gamification depends on both the learning environment's quality and the appropriateness of the gamified intervention (Tahir et al., 2022). Poorly designed gamification or ineffective educational systems may fail to yield desired results, emphasizing the need for balanced integration to foster meaningful learning experiences.

Learning Outcomes

Learning outcomes refer to the specific abilities or skills that students should demonstrate by the end of an educational process (Diab & Sartawi, 2017). These outcomes are typically categorized into three primary domains: cognitive, psychomotor, and affective, which describe the knowledge, physical skills, and emotional/attitudinal changes students are expected to achieve (Savickiene, 2010). Learning outcomes are considered multidimensional, highlighting the idea that they can manifest as changes in knowledge, attitudes, or abilities.

Cognitive Domain (Mental Skills/ What Learners 'Know')

The cognitive domain focuses on a student's thinking abilities and intellectual capacity. On the other hand, it represents the foundational level of Bloom's taxonomy, often referred to as the intellectual or knowledge domain (Bloom, 1956; Forehand, 2010). Within this domain, learning progresses through hierarchical sub-levels: Remember, understand, apply, analyze, evaluate, and create (Kurt, 2021). Students move to higher levels of cognitive complexity once they master the objectives at lower levels. According to Nusche (2008), cognitive learning outcomes range from acquiring specific knowledge in a particular field to developing general reasoning and problem-solving skills. As a result, progress in this domain can be assessed through measures like test scores, grades, and analytical skills.

Affective Domain (Attitude/ How Learners 'Feel')

The affective domain focuses on the ways in which students experience and manage their emotions, feelings, values, sense of appreciation, enthusiasm, and attitudes towards learning (Clark, 2015). Learning outcomes in this domain are defined as the attitudes, values, and dispositions students should develop throughout their education (Savickiene, 2010). It can be understood as the development of emotional and attitudinal growth (Forehand, 2010). The sub-levels of the affective domain range from receiving and responding to information, to valuing, organizing ideas, and internalizing them into consistent behavior patterns (Krathwohl et al., 1964).

Assessing the affective domain is complex because attitudes and values are internal states that are not easily observable (Gagne, 1984). As a result, traditional assessments like tests or written assignments are less effective for this domain. Instead, educators use alternative methods such as portfolios, reflective journals, diaries, projects, and observations of student behavior to assess shifts in attitudes and values (Savickiene, 2010; Diab & Sartawi, 2017). Outcomes in this domain can be inferred from student responses, actions, and discussions during the learning process, offering a more nuanced view of how they engage with the content (Savickiene, 2010).

Psychomotor Domain (Physical Skills/ How Learners 'Do')

The psychomotor domain is concerned with physical or manual tasks and activities (Harrow, 1972). It is often referred to as the skills-based domain, focusing on how students develop and demonstrate physical abilities (Forehand, 2010). This domain consists of different stages, ranging from basic actions to more advanced, refined skills. These stages include imitating, manipulating, achieving precision, articulating, and eventually naturalizing the skill (Harrow, 1972). Essentially, the outcomes in this domain show how well students perform physical tasks because of their learning, reflecting their progress in mastering physical or manual skills.

Methodology

Research Design

This study is a systematic-like review which is also known as 'systematized literature review' that incorporates elements of the systematic review process (Grant & Booth, 2009). Robson (2016, p. 83) highlights that traditional literature reviews are "often unsystematic and unfocused," lacking the clarity and rigor of systematic reviews. Traditional reviews generally do not emphasize transparency or specific guidelines, while systematic reviews offer a structured approach to locating, screening, and synthesizing primary research materials (Ibid.). Nevertheless, the comprehensive process of conducting a systematic review is resource-intensive, requiring a team of researchers and significant time investment (Robson, 2016, p. 85). Considering these constraints, a desk-based traditional literature review, incorporating elements of systematic review methods, is more appropriate for this project given the available resources, timeframe, and need to analyze empirical data.

Inclusion and Exclusion Criteria

A specific set of criteria was established to identify and include studies that are directly relevant to the research topic and questions, while excluding those that did not meet the required conditions. The inclusion and exclusion process is a critical step in research as it helps define the scope and validity of the results obtained from the literature review (Buckley & Doyle, 2016). The following outlines the criteria used for inclusion and exclusion of studies.

Table 1: Inclusion and Exclusion Criteria

Included	Excluded
Articles in English	Non-English articles
Peer-reviewed articles	Book chapters, case reports and article commentary
Empirical studies	Studies with opinions and suggestions or only as abstract
Must have used at least one game element	Non-digital game-based learning

Search Strategy

The search for articles in this study used keywords (“Gamification” OR “gamified”) AND (“learning outcome” OR “learning output”) in the title and abstract sections in 7 Educational technology journals (British Journal of Educational Technology, Computers in Human Behavior, Journal of Educational Technology & Society, Education Technology Research and Development, The Internet and Higher Education, and Journal of Computer Assisted Learning) in the search process. The time span of interest was empirical research published between January 2015 and April 2024.

The initial search yielded an overwhelming number of results, with nearly 2,500 entries from British Journal of Educational Technology alone. This highlighted the need to refine the search scope and strategy to obtain a more targeted and manageable dataset. As a result, the search parameters were adjusted to focus specifically on publications where the term "gamif*" appeared in the title field rather than throughout the abstract or full text. This adjustment ensured that the selected papers centered on gamification as a primary research focus, rather than merely referencing the concept in passing.

Study Selection

The initial search results from two databases produced a total of 781 articles. After initial screening, 695 articles were excluded based on duplicates, title review and abstract review. The remaining 86 were scoped for further information. Further, in accordance with the inclusion and exclusion criteria, 46 articles have been excluded as not being relevant to the scope of this literature review. Eventually, this resulted in 40 articles which have been used in this literature review.

Data Extraction and Analysis

The data from the selected articles was carefully reviewed, and initial ideas were recorded. Learning outcomes presented in the studies were analyzed and appropriately coded according to the research questions. Subsequently, the learning outcomes were classified into three main categories: affective, psychomotor, and cognitive. Additionally, studies that reported negative impacts of gamification or indicated a decline in learning outcomes were also documented. Finally, the influence of gamification on each of these categories was evaluated to provide a comprehensive understanding.

Results

The learning outcomes in gamification studies were categorized into affective, psychomotor, and cognitive domains. Table 2 and Table 3 below provides summaries of the impact of

gamification (positive and negative). The results of a single study may be applicable to two or even all three categories of learning outcomes. The domain most frequently discussed in gamification studies was cognitive, followed by psychomotor and affective, respectively.

Table 2: Positive Learning Outcomes

Learning Domain	Positive Learning Outcomes	Number of Studies
Affective	Positive attitude, Increased confidence level, Improved interest for learning, Feel competence	12 (30%)
Cognitive	Improved digital skills, improved general knowledge, Improved forecasting skills, improved critical thinking skills	26 (65%)
Psychomotor	Enhanced communication skills, improved discipline, Increased interactions, Decrease in unwanted behaviour	14 (35%)

Table 3: Negative Learning Outcomes

Learning Domain	Negative Learning Outcomes	Number of studies
Affective	Anxiety, Gor aroused, Reduced self-efficacy	4 (10%)
Cognitive	Less knowledge retention, Declined inquiry performance	4 (10%)
Psychomotor	-	-

Tables 2 illustrate that gamification generally had a positive impact on learning outcomes across various domains. Specifically, the cognitive domain showed positive impacts in 26 studies, the psychomotor domain in 14 studies, and the affective domain in 12 studies. Among the 40 studies reviewed, 32 exclusively reported positive outcomes, while 8 presented mixed results, highlighting both positive and negative effects (Anunpattana et al., 2021; Baydas & Cicek, 2019; Tsai, 2018).

Negative outcomes were associated with specific aspects, such as decreased knowledge retention (Baydas & Cicek, 2019), reduced performance (Tsai, 2018), and increased anxiety during initial gamification exposure (Anunpattana et al., 2021). Importantly, no negative impacts were reported in the psychomotor domain, whereas the cognitive and affective domains each contained two negative findings. These negative results align with recent studies, such as Bai et al. (2020), which linked gamification to anxiety and jealousy among students. Factors like the type of learner, the design or effectiveness of gamified applications, and the learners' interest in the subject matter were identified as potential causes of these adverse outcomes (Tahir et al., 2022). However, when comparing the positive impacts to the negative ones, the overall influence of gamification remains predominantly positive.

The change in behaviour or change in skills and performance refers to the psychomotor domain (Bloom, 1956). This domain aligns closely with one of the primary objectives of gamification: influencing student behavior through innovative learning strategies (Robson, 2015; Schoech, 2013). Consequently, this analysis highlights the effects of gamification on altering student behavior. For example, Jogo et al. (2022) demonstrated that gamification reduced inappropriate and undesirable classroom behaviors. Additionally, it enhanced teamwork abilities, oral communication skills, social skills, and overall competence among students (Alt & Raichel, 2020; Baydas & Cicek, 2019; Forndran & Zacharias, 2019; Martí-Parreño et al., 2021). These findings underscore gamification's potential to positively

influence students' interpersonal and collaborative skills while fostering a conducive learning environment.

Conclusion

The study highlights a significant positive impact of gamification on students' learning across cognitive, psychomotor, and affective domains. In the cognitive domain, gamification enhances academic knowledge, critical thinking, knowledge retention, and performance metrics like grades and test scores. It also fosters skills in forecasting and data analysis. Psychomotor improvements include teamwork, discipline, communication, and other soft skills, while affective outcomes include increased confidence, positive attitudes, and interest in learning. However, some negative effects, such as reduced calmness, self-efficacy, and occasional difficulties in knowledge retention, were also observed, though they were relatively minimal compared to the positive impacts.

The findings underscore the importance of integrating gamification into education to achieve holistic learning outcomes and encourage educators, policymakers, and designers to leverage these insights. Despite its promise, the study is limited by a small sample size (40 articles), language constraints, and a short-term focus on gamification effects. Future research should explore its long-term impact, applicability in language and non-STEM subjects, and primary education contexts. Additionally, the use of diverse game elements and cutting-edge technologies like AI and mixed reality, along with investigations into individual learner traits and demographic factors, could further enrich the understanding and application of gamified learning strategies.

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