A Review of Gamification Impact on Student Behavioral and Learning Outcomes

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Abstract—Gamification has become a new trend in learning in the 21st century, by utilizing technology with game elements to change behavior and support learning outcomes. However, few researchers have focused on the comprehensive impact of gamification in helping researchers to better understand developments over the past few years. The ScienceDirect, Taylor and Francis, Springer, Wiley, and SAGE publisher databases were surveyed and a total of forty articles from 2016–2021, were selected for review. Data analysis using NVivo 12 Plush software, with Hierarchy Chart and Mind Map methods. The main findings indicate the positive impact of gamification on student behavior and learning outcomes, including affective, cognitive, behavioral, and performance or others. The researcher recommends the continuity of gamification on learning outcomes and behavior, that interface design and teacher cognitive abilities are strategies or successful learning.

Keywords—gamification, motivation, engagement, orientation knowledge, affective outcomes

1 Introduction

Recently, digital games have been used for a wide range of purposes in schools and colleges. The increase in the development of learning models with the use of digital games is driven by the widespread change in people's behavior in the use of digital technology in their daily lives, [1]. In this way, the use of digital technology has become common in human life, including the use of digital games for students. The increased interaction with the use of digital games offers possibilities for developing new learning models with a digital gaming approach. In the context of education, many believe that the use of digital games can provide new ways to support learning and will ultimately impact the improvement of learning outcomes [1–3].

The learning model using game elements and game use techniques that are designed in an off-game context or a learning model with a game approach is referred to as gamification [4, 5]. Currently, gamification or game-based learning has become a new trend in learning by using technology with game elements to promote behavior and encourage desired learning results. A review of the gamification literature showed that gamification was mainly used in education [6–9]. This learning model was built on the basis of constructivist learning, which predicts the need for experiential learning through social interactions with the environment and peers [10, 11]. Interestingly, this learning approach encourages fun and meaningful learning so students can participate in productive learning activities [13]. Furthermore, gamification is also considered to be able to encourage human motivation and performance for certain activities [14]. The benefits of this gamification approach provide an incentive for students to participate in classroom learning activities.

A study [15], developed a gamified platform that is integrated with an online e-learning portal with the finding that gamification is able to attract users' attention to engage in the education system and increase interactivity and engagement. In fact, student motivation and participation in learning activities are important elements for improving learning outcomes, [15, 16]. In many cases, students feel bored and are not interested in learning materials because teaching methods are not considered communicative, [12]. This lack of interest will become an impediment to direct student participation in learning and there is concern that this will negatively impact student learning outcomes. Motivation plays a significant role in affecting student learning outcomes. A high motivation to engage in learning with the gamification method will be more effective in influencing students' subject matter expertise and attitudes toward lifelong learning [18]. In short, the concept of gamification in learning is one way of changing student behaviour, through a digital play approach. Because, essentially, game-based learning describes the use of fun content as an online learning technique to achieve educational objectives [16, 17].

Gamification has an important position in the world of education both in schools and universities, but there is still little research that discusses how the impact of implementing gamification on student learning outcomes has been comprehensively discussed. Information about the impact of applying gamification will provide an overview for teachers or teachers to plan and develop gamification learning methods. The purpose of this literature review research is to analyze the significant impact of gamification in improving learning outcomes and behavior of elements of students' attitudes, cognitive, behavior, and performance. The research question in this context is what the deeper game elements of gamification inside are improving learning outcomes and changing behavior. Thus, the popularity of gamification and its variety of success in the context of education strengthens potential, beliefs, and preferences. This study reviews and collects existing knowledge about the topic and presents it in a structured manner.

2 Methods

To reveal the effect of the gamification method on student learning outcomes, we conducted a literature review (SLR) using a systematic and specific method to identify,

select, and collect all materials relevant to the research question, [21]. Specific steps include (1) database search; (2) inclusion and exclusion criteria; (3) study selection; (4) data analysis and extraction; (5) summarizing and interpreting findings; and (6) compiling reports, [22].

Selecting documents through a review of titles, abstracts and complete documents containing the specified search terms and adopting search keyword links using Boolean (OR) and (AND) operators. The document search for this study used keywords "(games OR gamification) AND (education OR learning output)" in both online catalogues. For ease of finding articles in this study, we limit articles to the education sector. The types of papers reviewed include review papers and original searches. In addition, we are restricting the period for publishing articles from 2016 to 2020. The search criteria for articles in the two online catalogues consisting of ScienceDirect and Taylor and Francis Online are shown in Table 1.

Table 1. Distribution of retrieved papers among sources

Publishers	Search Link	Total Amount	No of Selected
ScienceDirect	https://www.sciencedirect.com	16.915	18[a]
Taylor and Francis	https://www.tandfonline.com	1.371	13[a]
Springer Nature	https://link.springer.com	79	4[a]
Wiley	https://onlinelibrary.wiley.com	24	3[a]
SAGE Publications	https://methods.sagepub.com	19	2[a]

Note: [a]Theoretical papers.

The inclusion criteria were applied to screen study variants, select, and include articles relevant to the research objectives and exclude studies that did not meet the requirements. Inclusion and exclusion criteria, are presented in Table 2 below.

Table 2. Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Publications in English	Non-English publications
Gamification in education	Outside the area of education
Peer reviewed articles published from 2016 onwards	Conference papers and dissertations
Empirical quantitative and mixed-methods studies	Discussions, qualitative and theoretical studies
Instruments explicitly measuring learning outcomes	Competence, anxiety, and self-confidence
No restrictions on how teacher identity is conceptualized	Open-ended questions

A total of 40 articles was further analyzed to provide findings regarding the research question. The validity and credibility of the study were applied by means of extraction, as a triangulation procedure [23]. The thorough review is based on review and analysis of learning outcomes. Child elements or criteria are searched for using systematic keywords. Then convergence and verification of findings are carried out, data analysis is carried out at the final stage after the completion of the triangulation procedure. The data analysis stage uses the Nvivo 12 Plus application with the aim of making it easier

to find derived elements or criteria based on the research objectives, [24]. The steps taken are (1) auto code analysis is used to automatically find common themes; (2) the selection of themes from the results of the auto code based on the research objectives, namely the impact of gamification on learning outcomes; (3) code consolidation where the similarity of meaning is grouped according to the impact of gamification on learning outcomes; and (4) submission of data to map elements of the impact of gamification on learning outcomes.

3 Result

3.1 Characteristic research

Gamification is a game design element with a non-game context, [25]. The 40 research articles from four leading publishers in 2016–2021. Distribution of studies (see Figure 1), by year as follows: 2016 (17.5%, n=7), 2017 (12.5%, n=5), 2018 (12.5%, n=5), 2019 (15.0%, n= 6), 2020 (27.5%, n=11), and 2021 (15.0%, n=6). The distribution of studies by the publisher is as follows: Elsevier BV (45.0%, n=18), Taylor and Francis (32.5%, n=13), Springer Nature (10.0%, n=4), Wiley (7.5%, n=3), and SAGE (5.0%, n=2). Overall, the selected articles are gamification in the context of education.

Fig. 1. Distribution of studies in years (2016–2021)

3.2 Elements of gamification on behavior and learning outcomes

The researcher identifies the findings into four elements that are sourced from empirical studies [26], and additional elements (others) that contribute and are personal. The elements in gamification include affective learning outcomes (33.33%, n=20),

cognitive learning outcomes (16.57%, n=10), behavioral learning outcomes (21.67%, n=13), student performance (20.00%, n= 12), and other elements (8.33%, n=5). Reference articles in each element are correlated with other relevant elements. The elements that are most often discussed in the success of gamification are studies on affective learning outcomes, and behavior.

Table 3. Element of gamification outcomes

Element of Gamification	Nu (%)	Papers
Affective Outcomes	20 (33.33)	(Aguiar-Castillo, Clavijo-Rodriguez, et al., 2020; Bakhanova et al., 2020; Cózar-Gutiérrez & Sáez-López, 2016; Díaz-Ramírez, 2020; Gil-Doménech & Berbegal-Mirabent, 2019; Huang & Hew, 2018; Hwang et al., 2016; Isabelle, 2020; Jayalath & Esichaikul, 2020; Khan et al., 2017; Khowaja & Salim, 2019; Laubersheimer et al., 2016; Legaki et al., 2020; Li & Chu, 2021; Morschheuser et al., 2017; Sailer & Sailer, 2021; Shipherd & Burt, 2018; Toda, do Carmo, et al., 2019; Toda, Klock, et al., 2019; Whitton & Langan, 2019; Xu et al., 2017), [24–44]
Cognitive Outcomes	10 (16.57)	(Bakhanova et al., 2020; Barrett et al., 2016; Caño de las Heras et al., 2021; Lameras et al., 2017; Legaki et al., 2020, 2021; Martí-Parreño et al., 2021; Pitura & Terlecka-Pacut, 2018; Sailer & Sailer, 2021; Shipherd & Burt, 2018), [25, 36, 39, 40, 45–50]
Behaviour Outcomes	13 (21.67)	(Aguiar-Castillo, Clavijo-Rodriguez, et al., 2020; Bakhanova et al., 2020; Barrett et al., 2016; Caño de las Heras et al., 2021; Carenys & Moya, 2016; Díaz-Ramírez, 2020; Laubersheimer et al., 2016; Martí-Parreño et al., 2021; Morschheuser et al., 2017; Pitura & Terlecka-Pacut, 2018; Sailer & Sailer, 2021; Toda, do Carmo, et al., 2019; Zou et al., 2019), [24, 25, 27, 35, 38, 39, 41, 45, 46, 49–52]
Student Performance	12 (20.00)	(Bai et al., 2020; Castronovo et al., 2018; Gil-Doménech & Berbegal-Mirabent, 2019; Hofacker et al., 2016; Hwang et al., 2016; Isabelle, 2020; Legaki et al., 2021; Liu, 2016; Martí-Parreño et al., 2021; Punia et al., 2020; Sailer & Sailer, 2021; Sanchez et al., 2020), [28, 30, 31, 39, 48, 49, 53–58]
Others *Image *Self-efficacy *Sense of belonging	5 (8.33)	(Aguiar-Castillo, Clavijo-Rodriguez, et al., 2020; Aguiar-Castillo, Hernández-López, et al., 2020; Díaz-Ramírez, 2020; Isabelle, 2020; Shi et al., 2017), [24, 27, 31, 59, 60]

3.3 Hierarchy chart and project map on gamification output

The elements in the gamification output are illustrated (Figure 2), where each element consists of several studies.
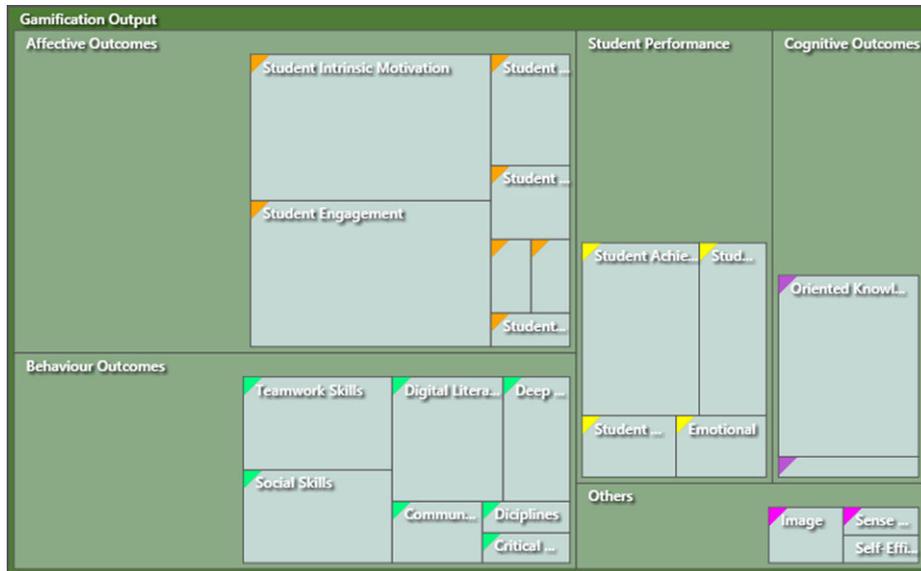
Fig. 2. Conceptual framework of elements in hierarchy chart-based gamification outcomes
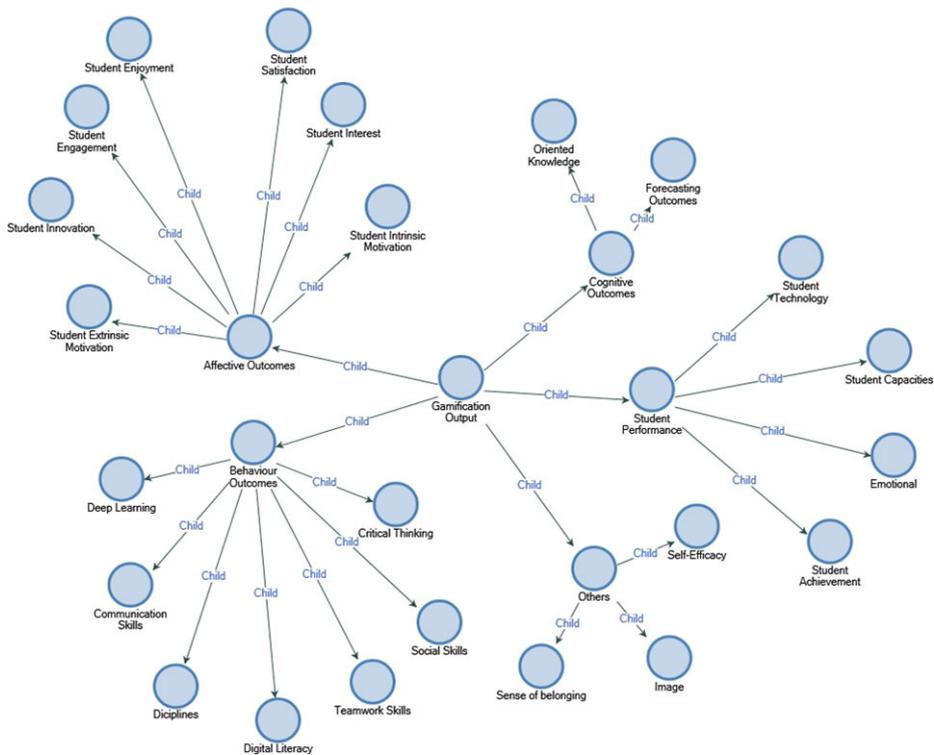

Fig. 3. Project map of gamification output element

The area of the area describes that the study is discussed most often, while the small area is the discussion that is discussed the least. Overall description of gamification output (Figure 3). Project Map explains that Gamification output consists of 4 priority elements and 1 complementary element. Elements on affective outcomes describe studies on student engagement, student intrinsic motivation, student extrinsic motivation, student interest, student enjoyment, student satisfaction, and student innovation. Elements on behavior outcomes consist of critical thinking, social skills, teamwork skills, digital literacy, disciplines, communication skills, and deep learning. Elements on cognitive outcomes consist of orientation knowledge and forecasting outcomes. Elements in student performance consist of student technology, student capacities, student achievement, and emotional. Additional elements consist of self-efficacy, image, and sense of belonging. In a study [64], explaining emotions, motivation, self-efficacy as variables, but this decision is still biased. Thus, this study is discussed in a wider cluster.

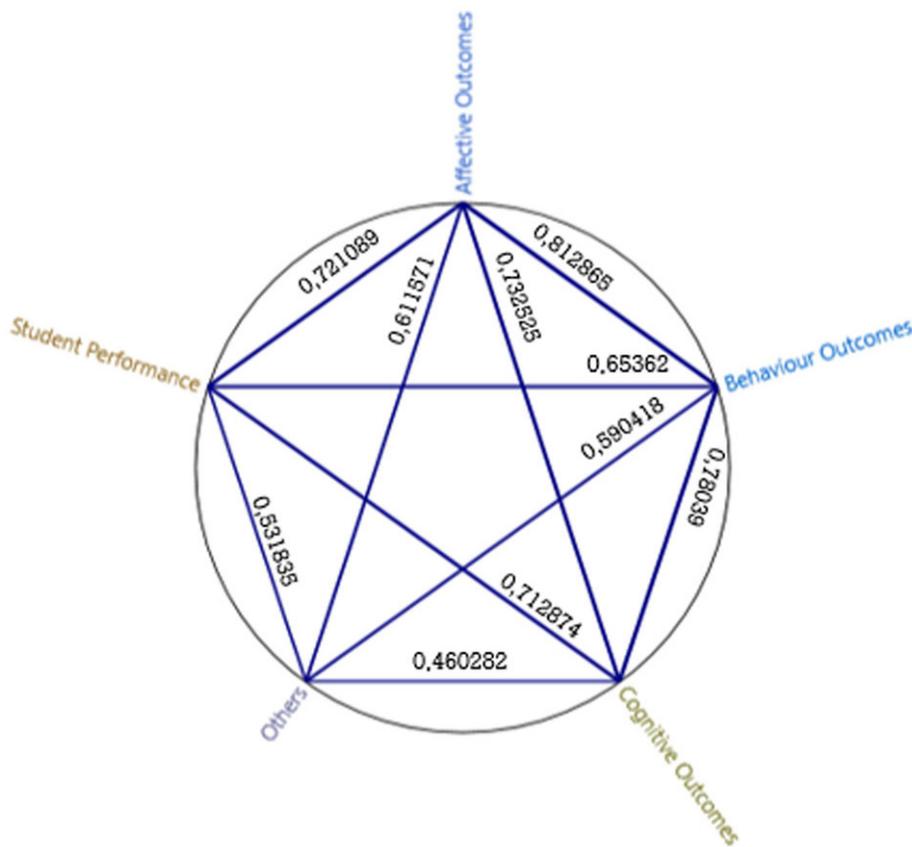### 3.4 Hierarchy chart and project map on gamification output

Fig. 4. The correlation between elements using Pearson' coefficient

In Table 4 describes the correlation between elements of the gamification output using a measured parameter, namely Person correlation (0–1). The higher the value (PC) or close to the value 1, the correlation between the two is very high. In Figure 4. The highest correlation is the element of affective outcome-behavior outcome of 0.812 (close to 1), while the lowest relationship is cognitive outcomes-others of 0.460. The three highest variables discussed are student intrinsic motivation, orientation knowledge, and student engagement. Furthermore, the relationship between variables is discussed for the person coefficient value exceeding 0.50 as follows.

Table 4. Correlation between elements and variables in gamification outcomes

Element Vs Variables		Pearson Coefficient
Affective Outcomes	Student Intrinsic Motivation	0,9016
Affective Outcomes	Student Engagement	0,8827
Affective Outcomes	Student Satisfaction	0,5784
Affective Outcomes	Student Innovation	0,5746
Behaviour Outcomes	Social Skills	0,7315
Behaviour Outcomes	Digital Literacy	0,6869
Behaviour Outcomes	Teamwork Skills	0,6439
Behaviour Outcomes	Communication Skills	0,5173
Cognitive Outcomes	Oriented Knowledge	0,9421
Cognitive Outcomes	Student Performance	0,6911
Cognitive Outcomes	Student Achievement	0,6447
Others	Sense of belonging	0,5793
Others	Self-Efficacy	0,5157
Others	Student Performance	0,5021

4 Discussion

The use of gamification learning programs in education has a significant impact on increasing the expected learning outcomes. An important impact of the application of gamification on the learning process is an increase in the affective element. Most gamification studies emphasize the effect of gamification on the affective element [24–44]. There are 20 out of 40 articles that emphasize the impact of gamification on the affective domain. The definition of the affective domain refers to the way a person handles something emotionally, such as internal and external motivation, enthusiasm, enjoyment, satisfaction, interest, and innovation. The results of the study explain that the variables of enthusiasm and internal motivation as key variables in the elements of affective learning outcomes, in the last five years. The enthusiasm of students in game-based learning is caused by motivation from within. Finally, enthusiasm and motivation are mutually reinforcing. Meanwhile, motivation arises from fun experiences during game-based learning. An important reason that gamification motivates, [25, 52, 62] learners (1) attempt more difficult tasks [32], and (2) develop the information literacy skills necessary for success, [38]. Thus, the learning objectives can be achieved.

Previous studies have found much on the impact of applying gamification in the context of education, including cognitive outcomes. Learning outcomes in cognitive terms refer to the structure of knowledge that develops using games as a means of learning [62]. Many studies have shown the benefits of using digital games in various research contexts, such as the study conducted [66], revealed that gamification has a positive impact on student retention. Another study, multi-dimensional game-based learning helps software learners increase student knowledge [67]. Because, in reality, the concept of gamification provides an approach of knowledge transfer methodology in the context of learning [68]. It is therefore entirely natural that the use of gamification has an impact on students' understanding.

One of the main goals of implementing various game-based learning methods and strategies is to change student behavior. In this literature study, the findings reveal one of the impacts of applying gamification, namely increasing learning outcomes in the form of behavioral outcomes. Outcomes of behavior refer to the psychomotor field in Bloom's taxonomy. This domain describes the ability to manipulate physical behavior that focuses on changing and/or developing behaviors and/or skills. The results of this literature review study indicate that the impact of the application of gamification has an influence on behavior change, including teamwork, communication skills, social skills and digital literacy, [8, 37, 38].

Teachers believe that gamification promotes teamwork and oral communication skills, [9]. In other contexts, the application of gamification provides benefits for the development of skills such as teamwork, digital literacy, English, and content knowledge (history) [69, 71]. Meanwhile, Gamification has an impact on improving students' social skills [9]. The gamification feature allows students to learn collaboratively with other students. Case studies of learning problems (quiz type) can be arranged to be solved in groups or in collaboration.

The maximum use of gamification by teachers and students will increase student achievement in learning. Previous studies have discussed how gamification affects performance element. For example, research findings [72], show that challenge-based games with a gamification approach increase student performance by 34.75% on the topic of statistical forecasting. Meanwhile, [67] the use of gamification can improve project quality and output across all software processes and their study concluded that multi-dimensional game-based learning increases the probability of project completion in a timely manner. The findings of other studies are relevant to learning outcomes, namely image, self-efficacy, and sense of belonging. The use of learning using gamification can improve the perceived image and self-efficacy also increases, up to the level of sense of belonging [30, 34, 62, 73]. These three studies are other elements that are abstract (intangible) or other impacts after using gamification.

5 Conclusion

This literature review concludes that the use of gamification plays a significant role in improving student learning outcomes. It has been proven that gamification has an impact on student engagement, intrinsic motivation, extrinsic motivation, interest, enjoyment, satisfaction, and innovation in learning activities. In addition, the success of

gamification in behavioral outcome elements has an impact on increasing critical thinking, social skills, teamwork skills, digital literacy, disciplines, communication skills, and deep learning. The impact of success on elements of cognitive learning outcomes includes orientation knowledge and forecasting outcomes. Meanwhile, the impact of gamification on student performance includes technology, capacities, achievement, and emotional. The impact of gamification was also found on students' personal such as self-efficacy, image, and sense of belonging. These findings have implications for the development of strategies in learning using gamification, so that all elements of learning outcomes can be achieved in their entirety.

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