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Gamification in Education: Why, Where, When, and How?—A Systematic Review

Nilüfer Zeybek[1] and Elif Saygı[2]

Abstract

Defined as the utilization of game elements in nongame environments, gamification has been frequently used in education in recent years. The aim of the present study is to summarize the studies previously conducted on the use of gamification in education through a systematic literature review. When the studies conducted in 2000–2021 were examined, four main dimensions came to the fore: (i) the aim of gamification studies, (ii) the learning fields where gamification studies were carried out, (iii) the level of education at which gamification studies were carried out, and (iv) how gamification was integrated into the learning environment. The results showed that gamification is used for various educational purposes, at many learning levels in various environments, and in a wide variety of learning fields. In most of the studies, the positive effects of gamification and its potential to solve problems in education were reported.

Keywords

game elements, gamification, education, gamified course, systematic literature review

[1]Department of Mathematics and Science Education, Kahramanmaraş Sütçü İmam University, Kahramanmaraş, Turkey
[2]Department of Mathematics and Science Education, Hacettepe University, Ankara, Turkey

Corresponding Author:
Nilüfer Zeybek, Faculty of Education, Kahramanmaraş Sütçü İmam University, Avşar Campus, Kahramanmaraş, Turkey.
Emails: niluferzeybek@ksu.edu.tr/nlfr6891@gmail.com

Introduction

Gamification, which is defined as "the use of game elements in non-game environments" (Deterding et al., 2011), has been extensively used in education. The existing literature revealed the possibilities, potentials, advantages, and problem-solving role of gamification (Arnold, 2014; Kapp, 2012; Kim et al., 2018; Lee & Hammer, 2011; Miller, 2013; Sandusky, 2015; Stott & Neustaedter, 2013). Studies have mainly been conducted to determine whether gamification can be used as an instrument or method to increase motivation toward learned content, engagement with course content or the learning environment, and levels of achievement. The following benefits of gamification were reported, thus making gamification a subject of interest for researchers. Gamification

- Creates a game-like learning environment, provides the learner with opportunities such as starting, stopping, starting again, and making mistakes, and creates the perception that mistakes can be corrected (Lee & Hammer, 2011);
- Increases the learner's intrinsic motivation by giving the learner the experience of knowing and achieving (Buckley & Doyle, 2016);
- Allows the learner to make decisions about learning and to question the results of their decisions (Sezgin et al., 2018); and
- provides environments suitable for learner needs in the digitalized world (Kim et al., 2018).

Regarding gamification in education, model, and framework studies have been conducted in which gamification elements were used in educational environments where education and gamification were handled together. These elements are as follows:

- Mechanics,
- Dynamics,
- Esthetics,
- Story, and
- Technology.

To summarize these elements, which are frequently mentioned in the literature, mechanics is defined as the toolbox of gamification and enables gamification to work (Werbach & Hunter, 2012). The rewards, avoidance elements, status indicators, tasks, and rules are among these mechanics. Dynamics refers to the emotions and experiences in the process (Kim et al., 2018). Based on the Fun PLEX Model, these emotions and experiences may include challenge, competition, control, exploration, and fellowship (Korhonen et al., 2009). Esthetics, like dynamics, expresses the feelings and emotions experienced by the person in the process (Zichermann & Cunningham, 2011). Some researchers who consider esthetics and dynamics

separately explain the experiences in the process as dynamics and emotions as esthetics (Schell, 2011; Zichermann & Cunningham, 2011). The story, on the other hand, is defined as an artificial situation with characters, objectives, and challenges. It is one element that keeps the person engaged with the created situation and presented goals (Kapp, 2013). Lastly, technology refers to all concrete materials, information, and communication technologies employed in the gamification process (Kim et al., 2018).

Researchers have stated that the elements of gamification used may differ depending on the problems in education and the overall purpose of gamification. Kim and Lee (2015) presented a model (integrative gamification framework) by combining attention, relevance, confidence, and satisfaction, which is the educational environment design model, and the elements of Mechanics, Dynamics, and Aesthetics (MDA). Similarly, Kusuma et al. (2018) stated that education could be gamified by incorporating MDA elements into learning environments. Likewise, Tu et al. (2015) suggested that mechanics and dynamics should be included in gamified teaching. Toda et al. (2019) conducted a study on experts' opinions of elements that should be included in gamified education and stated that mechanics such as the story, goals, level, and progress are vital for a gamified educational environment and content. Kim et al. (2018) presented a holistic model for the use of gamification in learning and argued that the four elements of gamification (story, mechanics, dynamics, and technology) should be systematically integrated into the teaching environment.

Researchers have made various suggestions as to how these gamification elements should be used in the educational environment. Namely, Tu et al. (2015) recommended that gamification should have the following four steps: (i) determining the goals, (ii) determining and designing the necessary elements for the participation of the player, (iii) setting up the gamification environment, and (iv) designing the process. Garone and Nesteriuk (2019) identified three steps in the gamification design process in education: (i) preproduction, (ii) production, and (iii) postproduction. The preproduction step includes understanding (analyzing the context, user profile, and technology and identifying design needs) and designing (identifying the game elements and learning content). The production step is defined by development (the application of game elements into the existing learning system) and implementation (the use of the gamified system by students). Finally, postproduction involves the evaluation process, through which learning outcomes are checked. Kim et al. (2018) demonstrated the use of gamification in learning based on the Analysis, Design, Development, Implementation, and Evaluation model. This model requires the following steps: target analysis (examining the teaching content and students), design (determining the gamification elements to employ), development (integrating the gamification elements into the teaching content and materials), implementation (including the students), and evaluation (evaluating the product and process).

Much research on gamification in educational settings has been released with these theoretical underpinnings in mind. Nonetheless, the evidence-based results, the research methodologies, and how gamification is handled vary greatly. Thus, the

present research aims to portray an overall picture of the existing literature on the use of gamification in education and analyze it from various perspectives. To this end, four dimensions of the above studies presented themselves and formed the basis of the research questions: why, where, when, and how? Hence, the questions addressed in the study are as follows:

1. Why—What is the main aim of gamification studies? (Rationale)
2. Where—In which learning fields were gamification studies mostly carried out? (Scope)
3. When—At which level of education were gamification studies mostly carried out? (Sequence)
4. How—In what kind of learning environment was gamification integrated into gamification studies? (Modality)

Method

A systematic literature review was carried out to answer the above questions. Thus, by means of a systematic literature review, gamification studies in education were examined in terms of their aims, the learning levels of education in which they were mostly conducted, the learning fields in which they were mostly carried out, and the learning environments in which gamification was mostly integrated. The systematic literature review procedure was conducted on the basis of Preferred Reporting Elements for Systematic Reviews and Meta-Analysis (PRISMA; Moher et al., 2009). This procedure consists of four stages:

- Identification,
- Screening,
- Eligibility, and
- Inclusion.

The identification phase was carried out by constructing keywords and their combinations. In the research, the keywords *gamification*, *gamification and education*, *gamification in education*, *gamification design*, *gamification design in education*, *gamified lesson*, and *use of gamification in education* were used to find the related studies for review. In the screening phase, the following databases were examined:

- ACM Digital Library,
- IEEE Xplore Digital Library,
- ScienceDirect,
- Springer Link,
- Taylor & Francis Online,
- Wiley Online Library, and
- Web of Science,

By searching these databases using the keywords, 998 studies were found. From these, irrelevant and duplicate studies were removed. At the eligibility stage, the inclusion and exclusion criteria were determined. The studies were examined against these criteria to determine their suitability (see Figure 1). The inclusion criteria, determined by considering the purpose of the research, were as follows: (a) published in 2000–2021, (b) written in the English language, (c) master's thesis, dissertation, technical report, or paper published in a conference, journal, or book, (d) focused on gamification in teaching and/or learning, and (e) contained evidence or presented a theoretical framework about gamification in education. On the other hand, the exclusion criteria were as follows: (a) focused on serious games or educational games, (b) education and gamification were not handled together, and (c) secondary studies. The screening process in which these criteria were applied was done primarily by examining titles and abstracts.

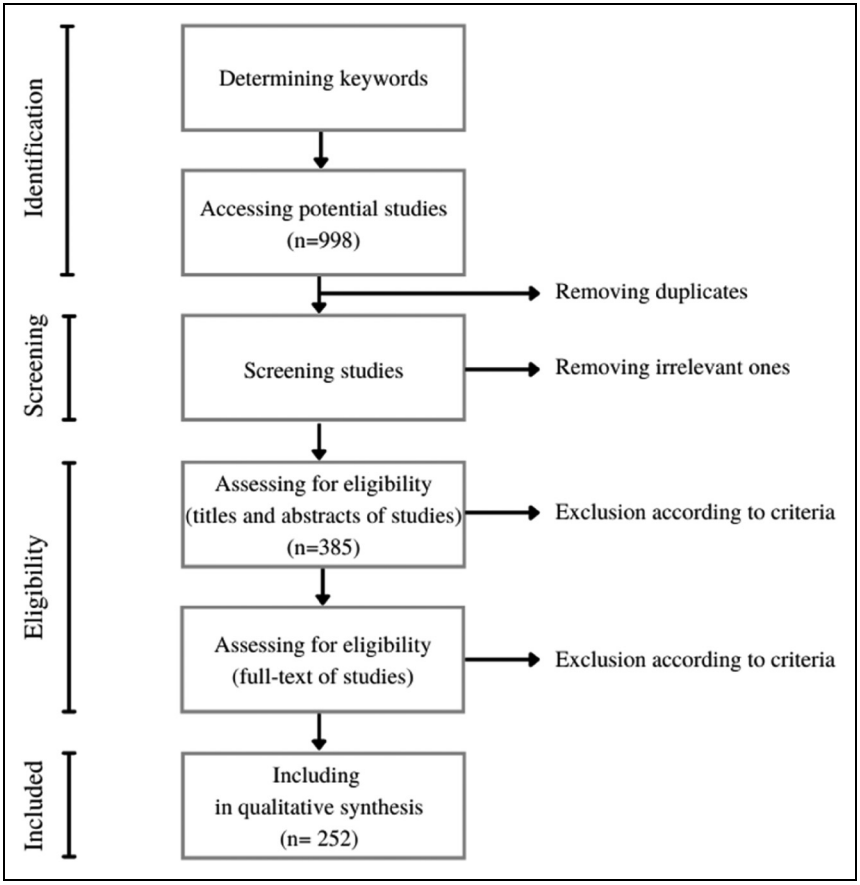

Figure 1. Study selection process.

The number of studies included at this stage decreased to 385. After the full-text assessment using the same eligibility criteria, it was decided that 252 studies would be included. Finally, the selected studies were subjected to content analysis, and the results were reported based on the four dimensions (why, where, when, and how). Preliminary codes were constructed in the first round of content analysis using the MAXQDA 2018 qualitative data analysis program. After the preliminary codes were examined and edited, all studies were re-coded using the final codes.

Results

Why?

It was observed that the studies focusing on gamification used in educational environments had various aims. Using various interventions, these studies aimed to explore the effects of gamification on learner motivation, engagement, and academic achievement in the learning environment and toward learning content. Some of these studies were based on one of the following pairs of variables: motivation and engagement, motivation and achievement, and engagement and achievement, while others included all three variables (motivation, engagement, and achievement). It was determined that 53 studies investigated the effect of gamification on learner motivation, 53 studies investigated learner engagement, and 47 studies investigated the academic achievement of learners. It is noteworthy that some of these studies addressed effects on multiple variables. As shown in Figure 2, when studies focusing on only one variable were examined, a total of 31 studies focused only on motivation, 30 focused only on engagement, and 13 focused only on achievement. Out of the studies that addressed binary combinations of these three variables, the number of studies focusing on motivation

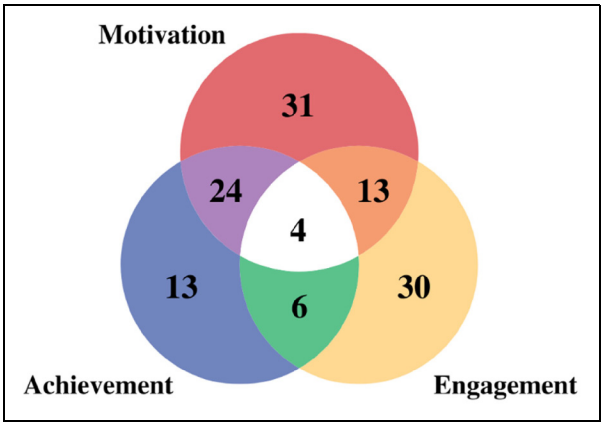

Figure 2. Why—number of studies using gamification in education according to their aims.

and engagement was 13, the number of studies focusing on motivation and achievement was 24, and the number of studies focusing on engagement and achievement was six. Finally, four studies focused on motivation, engagement, and achievement at the same time.

The relationship between gamification and motivation has been extensively studied in various learning environments, fields, and educational levels. The majority of the reviewed studies pointed to its positive effect on learner motivation and showed that it increased intrinsic motivation and the attitudes of learners toward the learned content in gamified learning environments (Buckley et al., 2018; Dicheva et al., 2018; Featherstone, 2018; Monterrat et al., 2014; Stoyanova et al., 2017).

The positive effects of gamification are seen in almost all the studies on motivation. Most of the studies were conducted with students or mass open online course (MOOC) users. Gamification had a positive impact on the intrinsic motivation, emotional state, and perceptions of students. In other words, the motivation-related components of the students who participated in the research were affected positively.

Another issue, which has an organic connection with motivation and is often associated with gamification, is engagement. The low level of engagement in educational environments is interpreted as a problem. Various interventional studies were conducted to increase levels of engagement. Most reviewed studies concluded that gamification is a possible solution to this problem (E.g., Aleksic-Maslac et al., 2017; Barata et al., 2013; Khaleel et al., 2020; Measles & Abu-Dawood, 2015; Ouariachi & Elving, 2020; Smiderle et al., 2019). In addition, most studies that primarily focused on the effects on learner engagement showed that the positive effects were mainly attributable to gamification (e.g., Akçapınar & Bilgin, 2020; Cahyani, 2016; Cassano et al., 2019; Chang & Wei, 2016; Goehle, 2013; Huang & Hew, 2015).

Most of the studies in the literature showed that gamification positively affects the engagement of the participants or has the potential to do so with the tools and environment it offers. Researchers have called our attention to a social engagement loop that facilitates engagement in environments where gamification is implemented. This loop increases learner engagement through the use of mechanics and dynamics. In this regard, studies examining the effects of the use of game mechanics attracted attention. The reviewed studies showed that points, badges, and leaderboards increased engagement as they provided feedback and showed progress (e.g., Andriamiarisoa, 2018; Dicheva et al., 2018; Khaleel et al., 2020).

It is worthwhile to note that some of the studies dwelt on the combination of gamification and academic achievement. Most of these examined the simultaneous effect on learner motivation and achievement. Specifically, experimental studies examined the effect of gamification on academic achievement, which was described by learning outcomes, success, and performance. In the majority of cases, these studies showed that gamification is an effective tool and has a high potential for teaching, but that its effect on achievement is reflected in different ways (e.g., Alomari et al., 2019; Bai et al., 2020; Yıldırım & Şen, 2021). Although many studies have presented evidence that gamification contributes positively to the achievement of learners (e.g., Huang et al.,

2019; Karayılan et al., 2018; Krause et al., 2015; Parra-González et al., 2020), some studies reported no significant change in student achievement in environments where gamification was used (e.g., Attali & Arieli-Attali, 2015; Meşe & Dursun, 2019; Ferriz-Valero et al., 2020; Prasetyo Aji & Napitupulu, 2018). Researchers examining the effect of gamification on student achievement noted that the use of gamification at different grade levels and in different learning fields contributed to student achievement. However, this differed in some field-based studies. Boudadi and Gutiérrez-Colón (2020) examined studies in the field of language learning and found that there were no clear connections between gamification and achievement in language learning, citing a lack of relevant evidence.

A review of the relevant literature demonstrated that gamification contributes to the acquisition of academic skills (such as problem-solving, quick response times, and creative thinking). However, even though some studies showed that gamification has positive effects on academic achievement, whether these effects are indeed due to gamification needs further investigation. While researchers have stated that a positive change in academic achievement may be due to motivation, engagement, or the learning process, some findings indicated that there might not be a direct link between these in some fields. However, gamification's positive effects on academic achievement in different learning fields should not be ignored. Many researchers argued that these positive effects stemmed from the flow theory, which underpins gamification and states that the presented task should be balanced with the learner's skills (e.g., Butler & Ahmed, 2016; Heryadi & Muliamin, 2016; Rachels & Rockinson–Szapkiw, 2018; Shi et al., 2014; Zatarain Cabada et al., 2020). In this way, it has been emphasized that a person is motivated by the flow and this motivation increases engagement and achievement.

Where?

The use of gamification in education has been investigated in various learning fields. Figure 3 presents the distribution of these studies conducted in 2000–2021 in relation to learning fields. These studies can be accessed from various databases (e.g., Web of Science, IEEE Xplore Digital Library, and Taylor & Francis Online). As indicated in Figure 3, the use of gamification has mostly been investigated in the fields of programming, language education, and engineering. These fields are followed by mathematics, science, medicine, and business. Most of these studies employed an experimental design and explored the potential effects of gamification in the given learning fields in terms of motivation, engagement, and achievement.

Studies have been carried out on teaching programming programs using gamification at all levels, from kindergarten to graduation, and in different learning environments. In these studies, it was stated that the motivation for learning simple programming and programming at an early age (preschool, primary school, and secondary school) has a significant effect on learning (e.g., Permana et al., 2018; Rojas-López & Rincón-Flores, 2018; Zatarain Cabada et al., 2020). For this reason, researchers suggested using gamification to enhance motivation and achievement

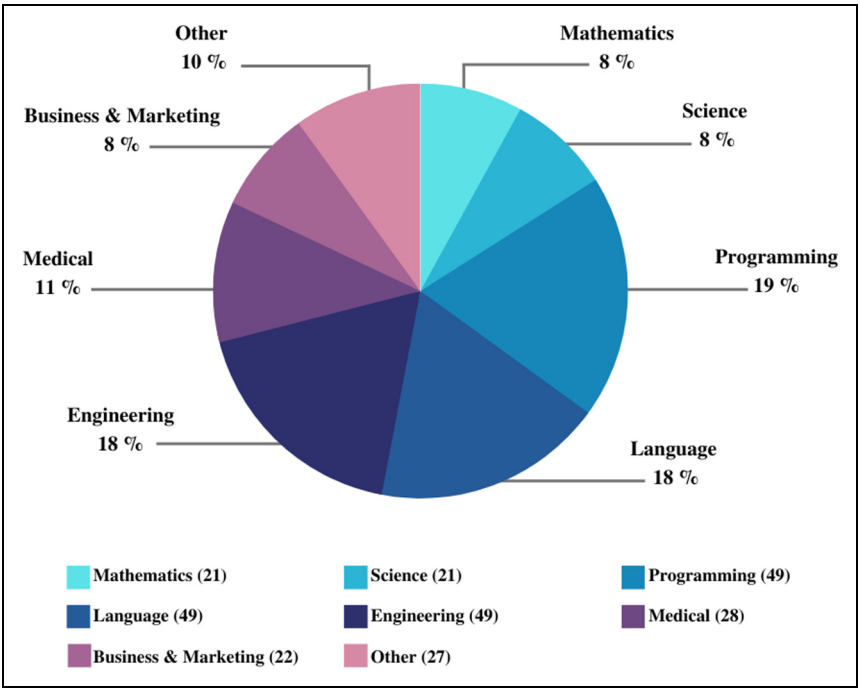

Figure 3. Distribution of gamification studies in education in various databases and accessible by learning fields (2000–2021).

(e.g., Prabawa et al., 2018). At the undergraduate level, gamification elements are added to programming courses, the effects of which have been investigated to support learning and increase the motivation of the students in various programs, including computer science, software engineering, and computer engineering. The majority of these studies concluded that the motivation of the learners was significantly increased in the programs into which game elements were integrated (e.g., Begosso et al., 2018; Carreño-León et al., 2018; Ibanez et al., 2014; Khaleel et al., 2017; Rojas-López et al., 2019; Smiderle et al., 2020). In addition, some researchers studying teaching programming in e-learning environments presented theoretical frameworks for the inclusion of gamification in teaching, while others conducted studies to demonstrate how gamification can be used to overcome problems related to low levels of engagement, which is one of the main problems associated with e-learning. (e.g., Bernik et al., 2017; Gafni et al., 2018; Gudoniene et al., 2016; Piteira & Costa, 2017; Schatten & Schatten, 2019; Swacha & Baszuro, 2013).

Gamification has been used in the context of *foreign language learning* (e.g., Anatolievna & Anatolievna, 2019; Cruaud, 2018; Dugalich et al., 2020; Harvey Arce & Valdivia, 2020; Veljković Michos, 2017), *vocabulary learning* (e.g.,

Boyinbode, 2018; Hrendus et al., 2020; Kingsley & Grabner-Hagen, 2018; Nahmod, 2017), *language proficiency development* (e.g., Juntunen, 2019; Perry, 2015; Rachels & Rockinson-Szapkiw, 2018), and *professional necessity* (e.g., Głowacki et al., 2018; Kayımbaşıoğlu et al., 2016; Perez & Masegosa, 2020; Puğ, 2020; Roosta et al., 2016; Yanes & Bououd, 2019) with a focus on various languages, including French, Arabic, Korean, Spanish, and English. Most studies in this area reported positive results in terms of increased learner motivation and achievement.

The present study examines the use of gamification in various fields, including software, computer science, and electrical and electronics engineering, with the participation of students enrolled in these programs. Researchers have determined that difficult concepts and overwhelming workloads cause a loss of motivation and a decrease in the level of engagement in engineering students (Marasco et al., 2016; Ruipérez-Valiente et al., 2017). To solve these problems, the studies conducted in the abovementioned fields suggested the use of gamification in the learning environment, curriculum (e.g., Uskov & Sekar, 2014), and course (e.g., Díaz-Ramírez, 2020; Ntokos, 2019; Pastushenko et al., 2019; Söbke, 2019) or course activities, such as laboratory work, discussions, homework, and projects (e.g., Hammerschall, 2019; Kim et al., 2016, 2018; Lambruschini & Pizarro, 2015; Leung & Pluskwik, 2018; Marasco, et al., 2016). These studies revealed that there was an increase in self-efficacy, motivation, engagement, and learning for engineering students when the instruction was gamified.

Another field where gamified education is extensively used is health education, including medical and nursing education. Researchers emphasized that gamification can provide opportunities for teaching by creating artificial environments in terms of consolidating knowledge and making applications in the field of health. Because of this, many studies are design-based and include topics such as gamification of *the curriculum* (e.g., Hensen et al., 2019; Yunyongying, 2014), *tomography interpretation* (e.g., Leba et al., 2014), *basic life support* (e.g., MacKinnon et al., 2015), *x-ray imaging and use of the C arm* (e.g., Süncksen et al., 2018), *disease detection* (e.g., Winkel et al., 2020), and *interventions* (e.g., García-Viola et al., 2019). Thus, learners are presented with non-life-threatening simulations. The studies revealed an increase in the motivation and performance of medical students and a decrease in the rate of mistakes, which was attributable to the resulting feedback.

Other learning fields where gamification is used include mathematics, science, business and marketing, social sciences, sports, music, accounting, architecture, and educational sciences. Most of the studies in these fields employed an experimental research design and were carried out at the undergraduate level. Research in these learning fields revealed the positive effects of gamification on student motivation, engagement, and achievement. The effects of gamification in mathematics education at various learning levels, from primary school to university, were examined. In the available studies, the effects of gamification on *learning mathematical operations* (e.g., Cunha et al., 2018; Halloluwa et al., 2018; Jagušt et al., 2018; Nand et al.,

2019; Papp & Theresa, 2017), *algebra* (e.g., Lo & Hew, 2020), *trigonometry* (e.g., Stoyanova et al., 2017), and *calculus* (e.g., Goehle, 2013; Rincon-Floreset al., 2018) were examined. The studies conducted in the field of science education indicated that gamification was used in the teaching of subfields, such as *chemistry* (e.g., Ares, Bernal, Nozal, Sánchez, & Bernal, 2018; Jenkins & Mason, 2020; Ramesh & Sadashiv, 2019), *physics* (e.g., Aşıksoy, 2018; Saprudin, Liliasari, Setiawan, & Prihatmanto, 2020; Silva, Sales, & Castro, 2019), and *biology* (e.g., Fan, Xiao, & Su, 2015; Fleischman & Ariel, 2016; Karayılan et al., 2018; Rivas, Palmero, & Rodríguez, 2019; Rouse, 2013).

Almost all the reviewed studies in the field of business and marketing were carried out in undergraduate education. In these studies, gamification was presented in business simulations with the aim of putting acquired knowledge into practice (e.g., Craven, 2015; Gatti et al., 2019; Jakubowski, 2014; Reiners et al., 2015). This method was used in courses on *entrepreneurship and business plan* (e.g., Aries et al., 2020; Isabelle, 2020), *resource and business management* (e.g., Mellado et al., 2019; Müller et al., 2015; Rajšp et al., 2017; Sepehr & Head, 2013; Stepanova et al., 2018; Wang et al., 2017; Wood & Reiners, 2012), *marketing* (e.g., Bechkoff, 2019; Dikcius et al., 2021), and *human relations* (e.g., Osipovskaya & Miakotnikova, 2020; Veltsos, 2017).

When?

The distribution of the studies in which the gamification of education was examined according to education level is shown in Figure 4. Most of the studies were conducted at higher education levels (undergraduate and graduate levels). In 187 studies, researchers used gamification in undergraduate and graduate education and examined its effects. Studies at this level were carried out in the learning fields of engineering, programming, medicine, and language. The undergraduate–graduate level was followed by primary, middle, and secondary levels of education. There were 49 studies in which gamification was used in primary and middle schools and 21 studies at the secondary school level. These studies concentrated on learning mathematics and science. It was determined that few studies (14) in which gamification was used for professional education were in the fields of medicine and programming. Finally, there were very few early childhood studies (5) that used gamification in teaching programs.

How?

Another dimension of focus in gamification studies in education is the effect of integrating gamification into the learning environment. From a holistic perspective, a learning environment is defined as a place where teaching is conducted using various methods. The relevant literature revealed that the learning environments into which gamification was integrated included e-learning, mobile learning (m-learning),

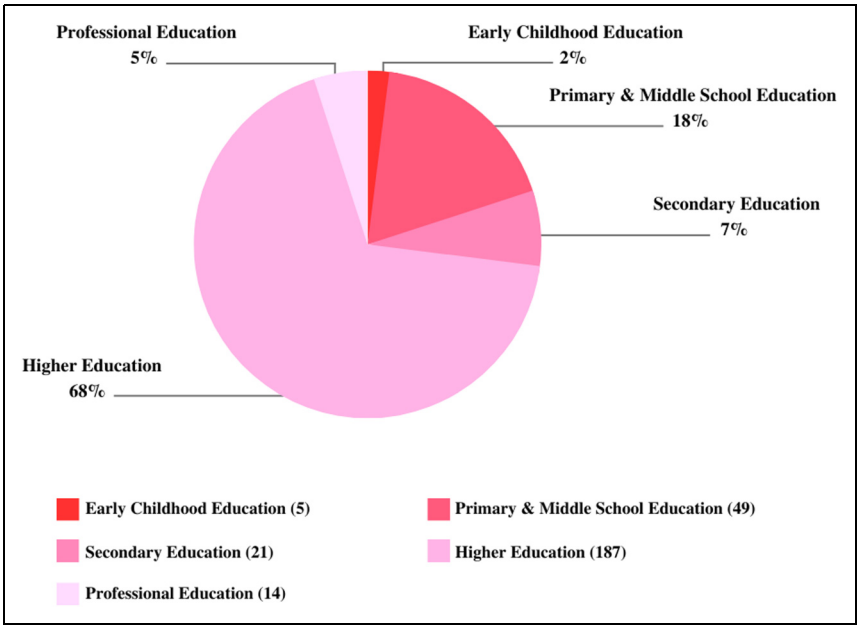

Figure 4. Distribution of gamification studies in education available in various databases by educational level (2000–2021).

open learning, distance learning, blended learning, flipped learning, collaborative learning, and face-to-face learning.

Research has focused heavily on the use of gamification in e-learning. Researchers have included gamification elements in these learning environments and have conducted various studies to increase motivation, engagement, and achievement. These studies were conducted at the undergraduate level, as the low motivation and engagement levels of these students were the main problems in e-learning environments (Malas & Hamtini, 2016; Measles & Abu-Dawood, 2015; Rutkauskiene et al., 2016). Studies on gamified e-learning revealed that gamification had a positive impact, increasing students' levels of motivation (e.g., Aleksić-Maslać et al., 2018; Hamzah et al., 2015; Hassan et al., 2021; Kaufmann, 2018; Monterrat et al., 2014; Shi et al., 2013). The findings also showed an increase in students' levels of engagement with the lessons (e.g., Bouchrika et al., 2021; Gudoniene et al., 2016; Katsigiannakis & Karagiannidis, 2017; Mohamad et al., 2017; Muntean, 2011; Poondej & Lerdpornkulrat, 2019; Rutkauskiene et al., 2016; Wongso et al., 2014).

Open learning environments are among the e-learning environments in which gamification is extensively used. MOOCs are one of the most common examples of these environments, with unlimited and free online courses and no entry or enrollment requirements (Gabel, 2013). The reviewed studies demonstrated that gamification is often integrated into MOOCs. The fundamental problem in this learning environment

is the low level of learner engagement, as MOOCs are open to everyone and do not have a structure in which sanctions can be imposed for lack of participation in class and course activities, as is the case in formal educational settings (Antonaci et al., 2017; Bakar et al., 2018; Chauhan et al., 2015; Dikcius et al., 2021; Klemke et al., 2018; Rizzardini et al.,2016; Zhu et al, 2017). Hence, several researchers have aimed to increase engagement by gamifying course content and implementation and designing gamified MOOCs to motivate students. Students' levels of engagement and success in learning outcomes increased in MOOCs that included gamification (e.g., Antonaci et al., 2017; Flores et al., 2020; Khalil et al., 2017; Martínez-Núñez et al., 2015; Romero-Rodriguez et al., 2019).

Mobile learning, which is frequently encountered, is defined by Quinn (2000) as a means of learning that is free of the limitations of time and space, enables easy access to resources, and allows intense interaction and performance-oriented assessment. While this type of learning is based on mobility (Shepherd, 2001), many researchers emphasized that learning becomes more fun and effective by combining the opportunities offered by mobility with those offered by gamification (Brophy, 2015; Chin, 2014; Khaddage et al., 2014). Studies on gamification in m-learning employed an experimental research design and were primarily conducted in the field of language learning, followed by programming and the education of children with special needs. Results showed that achievement and motivation were positively affected in the m-learning environments where gamification was used (e.g., Brophy, 2015; Ifigenia et al., 2018; Kétyi, 2016; Tundjungsari, 2018).

In recent years, gamification has been considered together with flipped/transformed learning. Flipped learning consists of three phases: (i) pre-class, (ii) during-class, and (iii) post-class. The reviewed studies showed that pre-class and/or post-class learning were mostly gamified to reveal their effects on learner achievement, motivation, and engagement in the fields of physics, mathematics, language, and computer science at different levels, and informed positive results, especially regarding learner motivation and engagement (e.g., Aşıksoy, 2018; Huang et al., 2019; Jo et al., 2018; Parra-González et al., 2020; Sailer & Sailer, 2021; Sırakaya, 2017).

Collaborative learning and blended learning are other learning environments in which gamification is used. The studies on the use of gamification in collaborative/cooperative learning, with the purpose of increasing engagement in group activities requiring cooperation, interaction, and sharing, yielded positive results (e.g., Betts et al., 2013; Halloluwa et al., 2018; Knutas et al., 2017; Li et al., 2013). Blended learning is the integration of online activities with face-to-face learning environments (Garisson & Kanuka, 2004). In blended learning environments, gamification is used in online and face-to-face learning environments or at the stage of establishing the relationship between the two. In the relevant studies, activities such as individual tasks, online discussions, and online or face-to-face group work in blended learning environments were gamified through a learning management system. It was found that the learners are more motivated and more engaged in blended learning, mainly when gamification elements include rewards (e.g., de-Marcos et al., 2017; Meşe & Dursun, 2019; Tan & Hew,

2016). Moreover, it has been shown that gamification increases interaction and sharing among learners once collaborative learning is employed in blended learning environments (Meşe & Dursun, 2019; Uz Bilgin & Gul, 2020).

Conclusion and Discussion

This study aimed to examine research on gamification in education in various fields through a systematic literature review. Studies carried out in the years 2000–2021 were examined from the perspective of four dimensions for the purpose of providing a general picture of the use of gamification in education: the aims (why), learning fields (where), learning levels (when), and learning environments (how).

The results showed that the dimension of rationale is more dominant than the other dimensions. The themes of motivation, engagement, and achievement were consistently highlighted. In the reviewed studies, the researchers identified low levels of learner engagement and motivation, or a decline in learner engagement and motivation, as the main problems of learning and utilized gamification to provide incentives for learners with the aim of overcoming these problems. Most of these studies revealed a positive impact of gamification on engagement and motivation. This can be explained by the social engagement loop, which is the basis of gamification. The social engagement loop states that there should be a motivating emotion, social call to action, feedback, and visible progress that will ensure both participation and the return of participants; hence, gamification should be carried out by taking these elements into account (Zichermann & Cunningham, 2011). In e-learning environments and MOOCs, the presence of elements such as notifications and forums to attract the learner to the learning environment led them to act, while the system's feedback on learning and progress increased learner motivation.

On the other hand, the frequent use of gamification in digital learning environments, e-learning environments, and MOOCs may suggest that it is better suited to these. The introduction of digital opportunities and the integration of gamification into learning environments, as well as the use of teaching management systems such as Moodle, provide speed and convenience (Denmeade, 2015; Pirker et al., 2014). However, it should be noted that gamification is integrated into almost every learning environment and that it provides comparable contributions to motivation, engagement, and achievement. The effect of gamification, therefore, is not due to digitality but to theories about motivation, achievement, and engagement. In other words, gamification has the potential to solve problems and offer opportunities both in digital and nondigital learning environments.

The reviewed studies primarily investigated the use of gamification in the learning fields of language, engineering, and programming. This might be attributed to the intention to facilitate learning in these fields by gamifying courses in order to eliminate the perceived difficulty of these fields and learner anxiety. Unsurprisingly, the studies concluded that the use of gamification in these fields increased learner motivation and reduced anxiety. These results can be explained by the flow theory based on

gamification. For activities carried out in many contexts, Csikszentmihalyi (1990) argued that the ability of the individual and the perceived difficulty of the task should be in balance; that is, there should be flow. If this balance is broken or the task is too difficult compared to the individual's ability, anxiety arises, and boredom occurs if it is too easy. The main difficulty in language, engineering, and programming is that these fields are inherently and epistemologically difficult. Due to these difficulties, the inability of learners to complete the tasks assigned to them is an obstacle to teaching. Gamification prevents learners from experiencing anxiety by creating a state of flow (Werbach & Hunter, 2012). Thus, the learner remains within the learning process while being internally motivated by a feeling of success. Considering these effects, it can be predicted that gamification will decrease "mathematics anxiety," which is frequently reported in the literature. The use of gamification in learning fields such as mathematics, in which students develop anxiety in early childhood, can help learners reduce anxiety and develop positive attitudes toward such fields.

Finally, most of the reviewed studies were conducted at the undergraduate level. Concepts such as games and gamification may lead to false conclusions, as these studies were mostly conducted with children. However, it has been shown that especially the studies conducted from 2018 onwards were mostly at the undergraduate and graduate levels. From this, it can be deduced that the majority of the students with whom the studies were conducted are included in Generation Z. Considering the characteristics of this generation, the concepts of "digitality" and "game" naturally come to the fore. However, as stated by Selwyn (2009), although this generation was born into technology, they do not have high technological competencies. Nevertheless, they integrate technology into their lives through applications with easy-to-use interfaces. In addition, games or game-like situations have a central place in their lives. Members of this generation not only play games but also watch them on media such as Twitch and YouTube and socialize by communicating with other players in games by means of which they become involved in a community outside the game's context. Because of this, it is predictable that such individuals, who are mostly related to technology via the axis of social media and games, will also need these elements in their learning environments. Considering the expectations and needs of Generation Z and the next generation, gamification will provide a game-like learning environment, find solutions to problems in learning environments, and contribute to the motivation, engagement, and academic achievement of learners.

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ORCID iD

Nilüfer Zeybek https://orcid.org/0000-0002-6299-822X

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Author Biographies

Nilüfer Zeybek has a PhD in mathematics education at Hacettepe University, Turkey. She works as a research assistant doctor at Kahramanmaraş Sütçü İmam University. Her research interest includes geometry learning and teaching, teacher education, mental games, educational games, and gamification. https://orcid.org/0000-0002-6299-822X

Elif Saygi is an associate professor of Mathematics Education at Hacettepe University, Turkey. She received PhD degrees in Cryptography from Middle East Technical University, Turkey. Her research interest includes finite fields and their applications, Boolean functions, design and analysis of cryptographic algorithms and sequences. Her other interests include education of mental games. https://orcid.org/0000-0001-8811-4747