BEYOND PLAY: SYSTEMATIC INSIGHTS INTO GAMIFYING EDUCATION ACROSS PEDAGOGICAL, PERSONAL, AND GAMIFICATION DIMENSIONS

Dr. Duygu GUR
ORCID:0000-0003-2891-0535
Computer and Instructional Technology
Firat University
Elazig, TURKIYE

Dr. Yalin Kilic TUREL
ORCID:0000-0002-0021-0484
Computer and Instructional Technology
Firat University
Elazig, TURKIYE

ABSTRACT

Different variables such as motivation, achievement, and engagement have been investigated in studies on gamification in the field of educational technologies. However, the obtained results differ, which emphasizes the need for studies based on concrete findings related to current trends and needs. In this study, we aim to reveal current research trends regarding gamification in education, identify current research needs, and make suggestions to guide future research through our systematic review. Instead of presenting limited results linked to a certain education level, learning environment, or variable, we share the results of research undertaken at all education levels and digital learning settings collectively and by categorizing (pedagogical, personal, and gamification) all the variables examined. One of the important results of the research is that gamification can be an alternative for solving the problems regarding motivation and participation in distance education. In conclusion, we provide practical suggestions for educators and instructional designers on how to apply gamified learning environments.

INTRODUCTION

Games have changed with technological developments; whereas in the past, children played games on the streets where their houses were located, nowadays they mostly play games on the computer (Sahin & Samur, 2017). Thus, the digital game industry, which can rival the film and music markets, has emerged (Yilmaz & Cagiltay, 2004). The digital game industry has made great progress in recent years. As a result of these advances and developments, digital games have become an indispensable part of daily life, especially for children and young people. So much so that, according to the Video Games Industry statistics published in 2022, 3.2 billion people worldwide are active digital players. In the research findings, it is noteworthy that young people and children show great interest in digital games (Behnamnia et al., 2020). Therefore, digital games have been used for educational purposes for many years, based on the principle of "learning while having fun". However, some researchers have focused on transferring the positive aspects of digital games to non-game learning environments instead of using digital games for educational purposes (Dominguez et al., 2013). Thus, a new term that can be used in the field of education called "gamification" has emerged. Gamification is defined as the use of game-based mechanics, aesthetics, and game thinking to connect people, motivate them, improve learning, and solve problems (Kapp, 2012). Therefore, gamification can be

explained as the use of interesting features such as badges, experience points, leaderboards, and levels of games in non-game environments (Mese & Dursun, 2018). In gamified learning environments, students have fun in the learning process and encounter gradual challenges, thus increasing their interest and motivation for learning (Cheong et al., 2013). In addition, gamification features such as giving unexpected clues in the learning process (Dong et al., 2012) or providing the user with an advantage in time management (Fitz-Walter et al., 2011) affect motivation positively (Ozkan & Samur, 2017). Thus, with the use of gamification, the participation and motivation of the students are increased, and the learning process is transformed into a more active, interesting, fun, and qualified process (Sen, 2019). At this point, it is remarkable that the principle of "having fun while learning" is emphasized. However, when the research is examined, it is seen that the terms game-based learning and gamification are confused with each other. In fact, there is an important difference between game-based learning and gamification. Game-based learning aims at education through play, and these games replace learning; however, gamification does not replace learning; on the contrary, it focuses on making learning more participatory and sometimes overcoming some difficulties while learning (Codish & Ravid, 2014; Kim et al., 2009). Therefore, gamification has become popular in recent years and has been the subject of academic research since game elements are included in the learning process, and it is less costly than game-based learning. According to the Google Trends report, searches on gamification in education have increased in recent years (Figure 1).
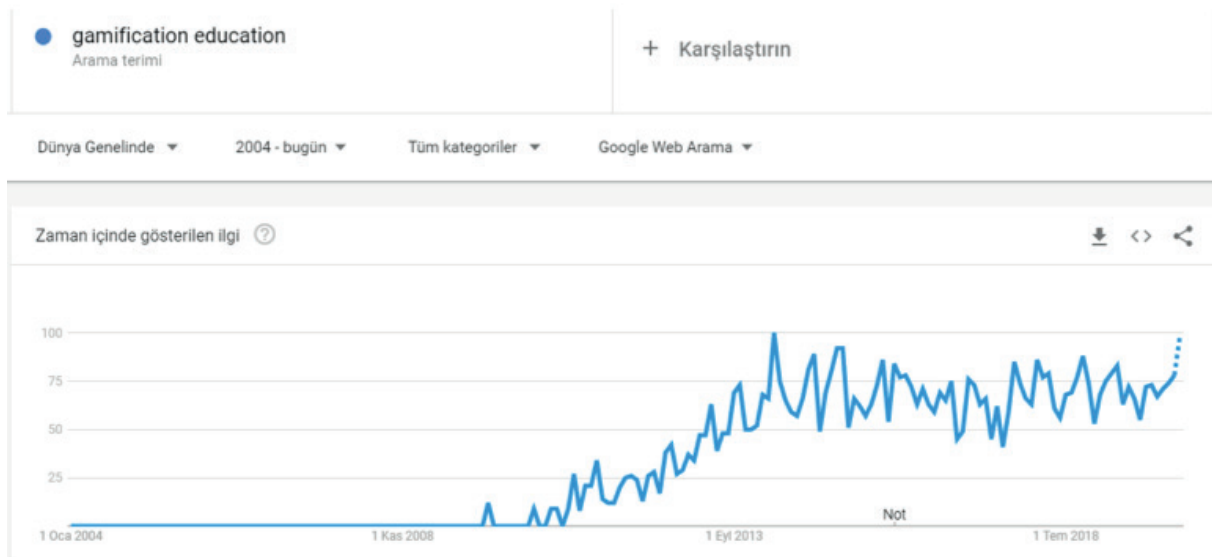

Figure 1. Interest in educational gamification over time

According to the graph in Figure 1, the sudden rise in the years 2010-2011 can be interpreted as the beginning of the transition from game-based learning to gamification. Gamification, which continued to increase in popularity after these years and peaked in 2013, continues to maintain its popularity and continues to be studied. Researchers have examined the potential benefits and challenges of gamification on many variables, such as academic achievement, motivation, participation, and satisfaction. However, there is still little evidence on how gamification should be implemented at different educational levels and on different digital platforms, how to deal with the challenges that may arise in this process, and the personalization of gamification. (Chugh & Turnbull, 2023; Ofosu-Ampong, 2020; Zeybek & Saygi, 2024). Majuri et al. (2018), Oliveira et al. (2022), and Almeida et al. (2023) state that more literature review studies are needed to fill this gap in the field. In addition, although it has been emphasized in research that the effectiveness of gamified learning environments may vary depending on personal characteristics, psychological needs, pedagogical factors, and the gamification elements used, we have not come across a systematic study that examines these factors together.

In this systematic review, we bring together research results on gamification at all education levels and digital learning environments by considering these dimensions in a holistic manner. The purpose of this study is to reveal the research trends and results on gamification in education in recent years by examining the studies on the use of gamification in education between the years 2016 and 2022. Considering that it is a subject that has emerged in recent years and is still being studied, putting together the research trends on gamification in education and the results obtained for the variables examined will contribute to the field in terms of determining the current situation and guiding future research. The research questions we seek answers to in this context are given below.

In gamification research,

- What are the definitions of gamification, and what are the common features of these definitions?
- What are the theoretical approaches and models based on gamification design?
- What research methods were used?
- What are the learning environments in which gamification is included?
- What are the game tools used in the gamification process?
- Which variables were examined, and what are the conclusions about these variables?

This systematic analysis can offer significant insights to researchers and individuals interested in the current state of research on the implementation of gamification in education. Additionally, it provides recommendations to educators and instructional designers on how to optimize the organization of gamified learning environments. In previous systematic review studies, researchers have analyzed different dimensions of gamification in education. Behl et al. (2022) aimed to reveal future research perspectives in the field of gamification and e-learning for young learners. Similarly, Khaldi et al. (2023) focused on providing a comprehensive overview of the current state of gamification in online learning in higher education. They also aimed to systematically explore different game elements and the gamification theory used in research. Freitas and Silva (2020) conducted a systematic literature review on the use of gamification in MOOCs (Massive Open Online Courses). Krath et al. (2021) examined the theoretical foundations used in gamification research, and Mora et al. (2017) conducted a systematic review of the design frameworks of gamification studies. Dehghanzadeh et al. (2019) and Shortt et al. (2021) analyzed the studies on the use of gamification in language learning. Zainuddin et al. (2020) presented the empirical findings of the literature in the field of gamification between 2016 and 2019. Denden et al. (2022) examined the role of learner characteristics in educational gamification systems. In their literature review, Oliveira et al. (2023) examined the results of studies covering the field of tailored gamified education. Almeida et al. (2023) carried out a thorough mapping analysis of the detrimental effects of game design components on education and learning systems. Dahalan et al. (2023) made a systematic analysis of the use of gamification in vocational education and training, while Ekici (2021) examined gamified flipped learning systems. All of these studies make a great contribution to the field; nevertheless, they contain results reached at a limited level of education, in a limited learning environment, and only for certain variables. In this study, we comprehensively present a systematic summary of the latest research trends and findings in the field of gamification in education by reviewing 108 articles. We also present the results of research conducted at all education levels in digital learning environments in a more comprehensive and holistic way by categorizing all the variables examined. In our research, we discuss the results obtained in the studies we accessed without making any limitations within the scope of education level, learning environment, and investigated variables by examining them in three dimensions (personal, pedagogical, and gamification). These dimensions cover many variables, such as students' personality characteristics, learning performances and academic achievements, interests, motivations, perceptions, satisfaction levels, participation rates, game elements, and player types. Therefore, this systematic review reveals the current situation in the field of educational gamification over a wider range while also providing solutions and suggestions to guide researchers, educators, and instructional designers.

METHOD

Research Model

In the research, we examined the research published between 2016 and 2022 in order to reveal the current research trends on the use of gamification in education in the field of educational technologies in recent years. We used a systematic review method to answer the research questions guiding our study. Systematic review is an empirical method to minimize preconceptions, while identifying, selecting, and synthesizing a summary of research studies (Moher et al., 2015). In this study, we follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines as a protocol-driven system to document the a-priori road map (Crompton et al., 2021).

Data Collection Process

We conducted an extensive electronic search in the databases of Science Direct, Taylor & Francis Online, and Springer Link. In this process, we only considered the articles published in journals indexed by Web of Science (ESCI, SCI, SSCI) and did not include papers, theses, and books in the research. In addition, reviews, theoretical, design-based, and scale development studies were also not taken into consideration (Table 1). We used a boolean search string in the search; this technique uses keywords to select studies with high precision.

- Search terms:

  "gamification" OR "gamified" OR "gamifing" AND "education" OR "learning" AND "educational technologies" OR "instructional technologies"

Table 1. Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Published between January 2016 and December 2022	Papers, theses, and books
Published in Science Direct, Taylor & Francis Online, and Springer Link databases	Review and theoretical articles
	Design-based articles
Published in English	Scale development articles
Published in journals indexed by ESCI, SCI, SSCI	Not educational studies
Educational studies	Not educational/instructional technology studies
Educational/instructional technology studies	

We found 778 articles published between 2016 and 2022 as a result of our database search using the search terms mentioned above. Then, we excluded the studies that were not intended for use in education (f=317) and educwational technologies (f=39), reviews and theoretical studies (f=298), and studies conducted only for gamified environment design and/or model proposal (f=16) (Figure 2).
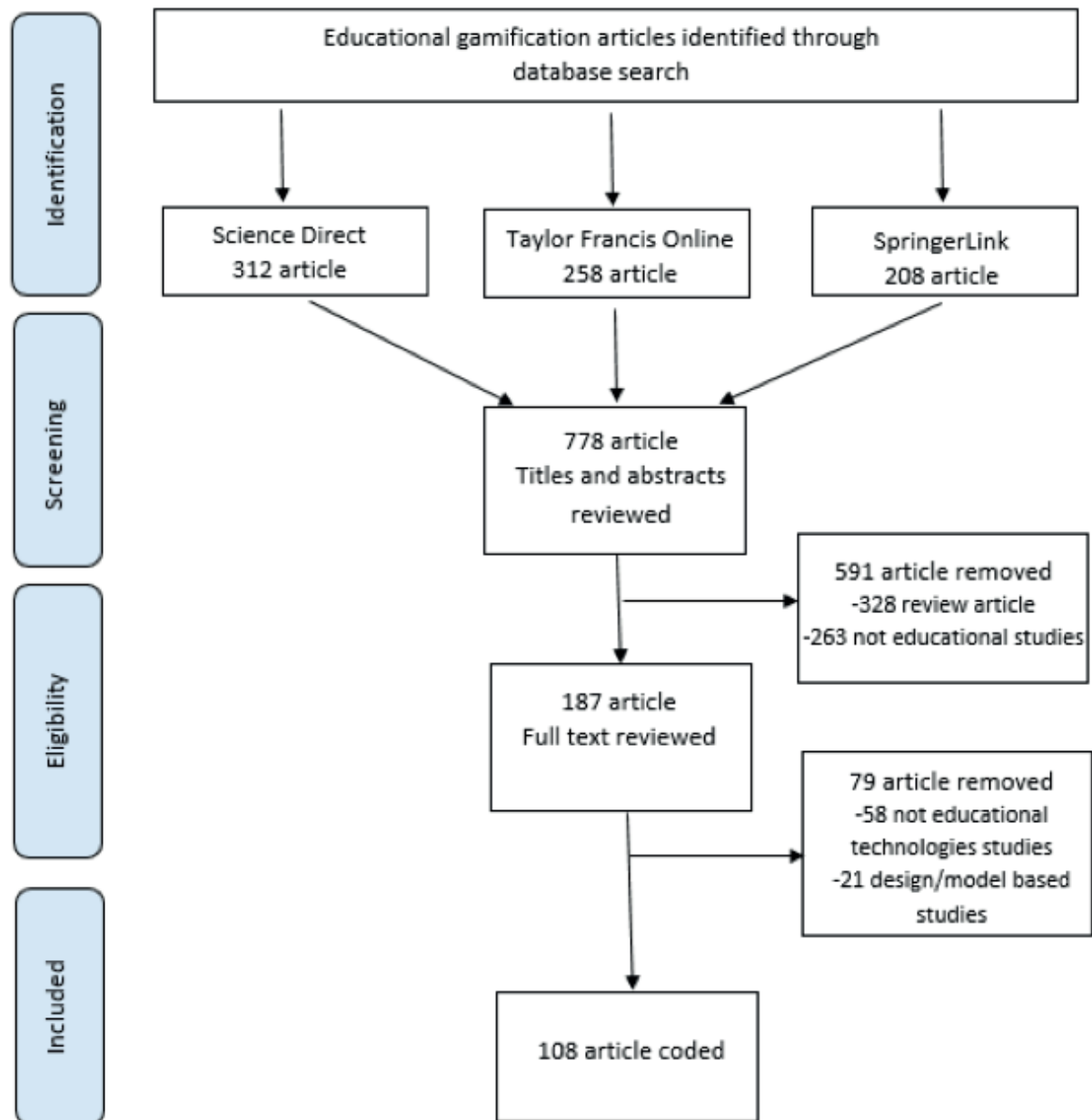
Figure 2. PRISMA flow diagram of the systematic review

Table 2. Reviewed articles

	Journal Name	Publication Year	Authors	f
Science Direct	Computers & Education	2016	de-Marcos et al. (2016) [1]	20
		2017	Albuquerque et al. (2017) [2], Buckley and Doyle (2017) [3], Ding et al. (2017) [4]	
		2018	Ding et al. (2018) [5], Garcia-Sanjuan et al. (2018) [6], Huang and Hev (2018) [7], Jagust et al. (2018) [8], Kyevski and Kramer (2018) [9], Tsay et al. (2018) [10], van Roy and Zaman (2018) [11], Zainuddin (2018) [12]	
		2019	Doumanis et al. (2019) [13], Orhan-Goksun and Gursoy (2019) [14], Park et al. (2019) [15]	
		2020	Chen et al. (2020) [16], Sanchez et al. (2020) [17], Zainuddin et al. (2020) [18]	
		2021	Bai et al. (2021) [19]	
		2022	Philpott and Son (2022) [20]	
	Computers in Human Behavior	2016	de-Marcos et al. (2016) [21], Tenorio et al. (2016) [22]	11
		2017	Cakiroglu et al. (2017) [23], Sailer et al. (2017) [24]	
		2018	Aldemir et al. (2018) [25]	
		2019	Ding (2019) [26], Groening and Binnewies (2019) [27], Lopez and Tucker (2019) [28]	
		2020	Putz et al. (2020) [29], Stoeffler et al. (2020) [30]	
		2021	Donnermann et al. (2021) [31]	
	International Journal of Human-Computer Studies	2019	Van Roy and Zaman (2019) [32]	5
		2020	Legaki et al. (2020) [33]	
		2021	Denden et al. (2021) [34], Lavoue et al. (2021) [35]	
		2022	Ulmer et al. (2022) [36]	
	Heliyon	2021	Jodoi et al. (2021) [37], Ruiz-Banuls et al. (2021) [38]	3
		2022	Alsadoon et al. (2022) [39]	
	Computers and Education: Artificial Intelligence	2021	Polito and Temperini (2021) [40], Tan and Cheah (2021) [41]	2
	Technological Forecasting & Social Change	2021	Legaki et al. (2021) [42]	2
		2022	Grijalvo et al. (2022) [43]	
	Entertainment Computing	2021	de la Pena et al. (2021) [44]	2
		2022	Dapica et al. (2022) [45]	
	Telematics and Informatics	2018	Ozdener (2018) [46]	1
	Health Professions Education	2019	Grangeia et al. (2019) [47]	1
	Journal of Hospitality, Leisure, Sport & Tourism Education	2021	Aguiar-Castillo et al. (2021) [48]	1
	Thinking Skills and Creativity	2021	Yildiz et al. (2021) [49]	1
	The International Journal of Management Education	2021	Kauppinen and Choudhary (2021) [50]	1
	Nurse Education Today	2022	Rosa-Castillo et al. (2022) [51]	1
	International Journal of Child-Computer Interaction	2022	Jogo et al. (2022) [52]	1

186

		Year	Reference	Count
Taylor & Francis Online	Interactive Learning Environments	2016	Buckley and Doyle (2016) [53]	10
		2017	Hung (2017) [54]	
		2018	Lo and Hew (2018) [55], Zatarain Cabada et al. (2018) [56]	
		2019	Hassan et al. (2019) [57], Huang et al. (2019) [58]	
		2021	Bouchrika et al. (2021) [59], Recabarren et al. (2021) [60], Haruna et al. (2021) [61], Ramirez-Donoso et al. (2021) [62]	
	Computer Assisted Language Learning	2018	Rachels and Rockinson-Szapkiw (2018) [63]	6
		2020	Hong et al., (2020) [64]	
		2021	Eryigit et al. (2021) [65], Prados Sanchez et al. (2021) [66], Tao and Zou (2021) [67]	
		2022	Foroutan Far and Taghizadeh (2022) [68]	
	Innovation in Language Learning and Teaching	2018	Cruaud (2018) [69]	2
		2019	Ho (2019) [70]	
	Innovations in Education and Teaching International	2018	Wu (2018) [71]	2
		2020	Basal and Kaynak (2020) [72]	
	Environmental Education Research	2021	Leitão et al. (2021) [73]	2
		2022	Cook et al. (2022) [74]	
	Journal of Education for Business	2018	Chapman and Rich (2018) [75]	1
	Distance Education	2019	Huang et al. (2019) [76]	1
	Research in Science & Technological Education	2021	Wommer et al. (2021) [77]	1
	Technology, Pedagogy and Education	2021	Erumit and Yilmaz (2021) [78]	1
	Educational Action Research	2021	Kulhanek et al. (2021) [79]	1
	Journal of Criminal Justice Education	2022	Gehring and Marshall (2022) [80]	1
	Music Education Research	2022	Carrion Candel and Colmenero (2022) [81]	1
	Physical Education and Sport Pedagogy	2022	Sotos-Martinez et al. (2022) [82]	1
SpringerLink	Education and Information Technologies	2021	Pakinee and Puritat (2021) [83], Areed et al. (2021) [84]	4
		2022	Leitão et al. (2022) [85], Balci et al. (2022) [86]	
	TechTrends	2016	Kopcha et al. (2016) [87]	4
		2020	Uz Bilgin and Gul (2020) [88]	
		2021	Nair and Mathew (2021) [89]	
		2022	Coffland and Huff (2022) [90]	
	BMC Medical Education	2020	Seidlein et al. (2020) [91]	3
		2021	Dugnol-Menendez et al. (2021) [92]	
		2022	Valenzuela-Pascual et al. (2022) [93]	
	Smart Learning Environments	2020	Smiderle et al. (2020) [94]	3
		2022	Oliveira et al. (2022) [95], Celik and Yangin-Ersanli (2022) [96]	
	Journal of Computing in Higher Education	2020	de la Pena Esteban et al. (2020) [97], An et al. (2020) [98]	2
	Journal of Formative Design in Learning	2017	Kenny et al. (2017) [99]	1
	Technology Knowledge and Learning	2017	Millis et al. (2017) [100]	1
	Journal of Computers in Education	2020	Zou (2020) [101]	1
	International Journal of Technology and Design Education	2020	Fernandez-Antolin et al. (2020) [102]	1
	Multimedia Tools and Applications	2021	Molero et al. (2021) [103]	1
	International Journal of Educational Technology in Higher Education	2021	MurilloZamorano et al. (2021) [104]	1
	Behavior Analysis in Practice	2021	Parry-Cruwys and MacDonald (2021) [105]	1
	Journal of Computing in Higher Education	2021	Zahedi et al. (2021) [106]	1
	Educational Technology Research and Development	2021	Zhao et al. (2021) [107]	1
	Medical Science Educator	2022	Walker et al. (2022) [108]	1
			Total	108

Based on our research goals, we analyzed a total of 108 articles: 53 from Science Direct, 29 from Taylor & Francis Online, and 26 from SpringerLink. Five of these articles were published in 2016, eight in 2017, 16 in 2018, 13 in 2019, 15 in 2020, 32 in 2021, and 19 in 2022 (Table 2). The articles analyzed in this study were published in the leading journals of the field and came from 32 different countries (Ireland, USA, Spain, Turkiye, Germany, Brazil, UK, China, Japan, South Korea, Belgium, Taiwan, New Zealand, Norway, Mexico, Pakistan, India, Egypt, Iran, Thailand, Tunisia, Estonia, Australia, France, Singapore, Algeria, Saudi Arabia, Greece, Italy, Chile, Portugal, Tanzania), across three different databases. Thus, it can be said that this set of articles is strong enough to provide valid generalizations of gamification in educational fields and in different nations (Zauniddin et al., 2020).

FINDINGS

Gamification Definitions and Features Used in Definitions

When we examined the articles in the research, we found that game-based learning was defined in order to explain gamification first, and the distinction between these two terms was pointed out. In addition, studies have emphasized that there is a transition from game-based learning to gamification. In addition, studies have emphasized that there is a transition from game-based learning to gamification. Most of the definitions used in the articles emphasize the use of game elements in non-game contexts and include features such as motivation, facilitating learning, problem solving, and active participation. Although it is stated extensively in the literature that gamification is a fun learning environment and that motivation can increase with competition among students, it is a remarkable finding that this feature does not take much place in the definitions. In addition, while gamification is defined as a method, technique, or strategy in some articles, it is also defined as an educational approach and a teaching tool in other articles.

Theoretical Framework of the Articles

In this review, we analyzed the theories and models that are most associated with gamification design in the articles and are based on the formulation of research questions. We saw that Self-Determination Theory was the most frequently used in the articles, followed by Flow Theory, and Werbach and Hunter's Model, and the theories and models used mostly showed gamification design and were motivation-oriented. In addition, it is noteworthy that 61% of the articles do not use any theory or model. This situation reveals that there is a theoretically important gap in the studies in the field of gamification.

Research Method and Participants

In this study, we examined the research method, model, and data collection techniques of the articles in line with the second research question. We found that the studies were mostly conducted as quantitative research (66%, f=71). While the mixed research method was used in 30% of the studies (f=32); the qualitative research method, on the other hand, had a usage rate of only 4% (f=4). This evidence reveals that more qualitative studies are needed in the field of gamification in education. In addition, 64% (f=67) of quantitative and mixed studies were conducted as experimental studies, and research data were collected using questionnaires and scales in 50% (f=56) and achievement tests in 23% (f=26). Participants were interviewed in all mixed and qualitative studies, and observation forms were also used in 5% of these studies (f=2). Other techniques used in research were evaluation forms, system data, and social network analysis.

According to our analysis, the majority of the studies were conducted with undergraduate-level participants (58%, f=63). In addition, we found that 9% (f=10) of the studies were carried out at the postgraduate level, 8% (f=9) at the primary school level, 9% (f=10) at the secondary school level, 4% (f=4) at the high school level, and 4% (f=5) in adult education. Only one study was conducted at the preschool level. It is one of the important findings of this study that few studies have been implemented at the preschool, primary, and secondary school levels, which are thought to have high interest and motivation towards gamification elements (Haruna et al., 2021; Jogo et al., 2022; Oliveira et al., 2022). Since academicians have easy access and practice opportunities, they may have chosen the participants mostly from the undergraduate level.

Gamified Learning Environment

Game elements can be used in many learning environments. Therefore, we also analyzed the gamified learning environments in the articles (Table 3). As a result, e-learning came to the fore in gamified learning environments. Mobile learning and flipped classrooms followed with 32% each. Additionally, the use of gamification in collaborative learning, blended learning, and virtual reality and augmented reality learning environments draws attention.

Table 3. Gamified learning environment and method

Learning Environment/Method	f	%
E-Learning	73	67
Mobile Learning	22	20
Flipped Learning	12	12
Virtual Reality and Augmented Reality	7	6
Blended Learning	6	5
Collaborative Learning	5	5
Social Network-Supported Learning	3	3
Smart Tutoring Systems	2	2
Artificial intelligence/Robotics	2	2
Simulation	2	2
7E Model	1	1
Deep Learning	1	1
Active Learning	1	1

Game Elements

In our study, we examined the game elements used in gamified learning environments. We have found the most commonly used game elements in the research to be; score, leaderboard, badge, level, team/group/collaboration, feedback, mission/challenge, reward, and social interaction, respectively. In addition, competition, clues, and peer assessment were seen to be used less frequently (Table 4). In a few studies (f=7), the score is reduced and reflected in the total score as a result of the user's mistake or wrong answer. In addition, a time limit is applied in 22% of the studies using the scoring system, and in 6% of the studies, hints are given when the user gives an incorrect answer or upon the user's request. In the use of badges, both the badges given automatically by the system and the badges sent by the instructor were used. Progressive challenges, another game element that has a high usage rate in research, are included as locked content in 30% of these researches. Thus, it is not possible to move on to the next level without completing a level. For social interaction, online discussion groups and forums were used in 64% (f=20) of the studies, blogging in 19% (f=6) and social media environments in 16% (f=5). In gamified learning systems; profiles created by students include nicknames, profile pictures, scores, badges, and rewards. In 15% (f=5) of the studies in which this system is used, these profile features can be purchased with earned points or badges.

Table 4. Game elements used

Game Elements	f	%	Game Elements	f	%
Points/Score	95	81	Progress bar	22	19
Leaderboard	69	59	Time limit	21	18
Badge	62	53	Freedom of choice	16	14
Level	56	48	Locked content	15	13
Task/Mission/Challenge	54	46	Meaningful story	13	11
Feedback	48	41	Instructions/Lesson map	9	8
Team/Group/Collaboration	47	40	Competition	8	7
Reward	42	36	Clue	6	5
Social interaction	31	26	Peer assessment	2	2
Avatar/Profile/Nickname	31	26			

Investigated Variables

Many variables have been investigated in studies conducted in gamified learning environments. We categorized these variables under three main groups in line with our analysis: pedagogical, gamification, and personal (Table 5). We also explained the pedagogical variables in three dimensions (cognitive, affective/ emotional and behavioral) based on the model proposed by Fredricks et al. (2004).

Table 5. Investigated variables

Pedagogical	Gamification	Personal
Cognitive Dimension Affective/Emotional Dimension Behavioural Dimension	Game Elements Type of Player	Personal Characteristics

One of the primary dimensions, namely the behavioral dimension, refers to the mix of behaviors of a student who is interested in learning and succeeding in academic areas such as class attendance, active classroom participation, participating in group work, and completing individual tasks on time. A second, namely cognitive dimension, refers to students' thoughts, beliefs, and perceptions about the importance of academic work and the effort this requires, along with the cognitive and metacognitive strategies the student would need to use to achieve significant learning. The third is an affective, or emotional dimension, which includes the student's positive and negative feelings and attitudes towards the educational institution and learning experiences.

Table 6. Variables investigated in articles

	Variables	f	%
	Cognitive Dimension	*79*	*73*
	Performance/academic achievement	60	55
	Learning Experience	12	11
	Problem Solving Skill	2	2
	Critical Thinking	2	2
	Learning styles	2	2
	Cognitive load	1	1
	Affective/Emotional Dimension	*70*	*64*
	Motivation	39	36
Pedagogical	Satisfaction	11	10
	Attitude	6	5
	Perception	5	5
	Self-efficacy	3	3
	Anxiety	3	3
	Interest	3	3
	Behavioral Dimension	*37*	*34*
	Engagement	32	30
	Class dynamics/Social relationship/Group cohesion	3	3
	Course/exam completion rate	2	2
Gamification	Game Elements	7	6
	Type of player	1	1
Personal	Personal characteristics	7	6

Results Regarding the Variables Investigated in the Articles

Pedagogical Variables

Results on the Cognitive Dimension

In the articles examined, cognitive skills such as performance, academic achievement, learning experience, problem solving skills, cognitive load, and learning styles of students in gamified learning environments were studied. 78% (f=47) of the studies investigating academic achievement and performance reported that gamification improved academic achievement and performance [1, 2, 3, 7, 8, 10, 12, 15, 17, 18, 21, 22, 23, 26, 27, 29, 33, 36, 38, 43, 44, 46, 47, 52, 53, 54, 55, 56, 58, 60, 61, 70, 71, 73, 76, 77, 84, 88, 89, 91, 94, 96, 97, 105, 106, 107, 108], while 19% (f=12) reported that it did not make a significant difference [6, 14, 16, 39, 50, 63, 75, 85, 88, 96, 104, 108]. An experimental study [20] revealed that performance decreased in a gamified learning environment. In this study, it was also stated that as a result of the decrease in the intrinsic motivation of the students over time, their performance may have been negatively affected. In addition, in a study [1], it was concluded that the students in the experimental group participating in the gamification activities carried out with social network support had higher achievement than the students in the experimental group participating in the classroom gamification activities. In a study [17] that found that gamification had a positive effect on performance, the novelty effect was looked into and as a result of the research, it was concluded that performance first increased with the novelty effect, but then decreased. However, in another study [59], it was determined that there was no novelty effect and that the increase in performance continued during vacation and after graduation. Looking at this variety of results, we can say that more studies should be conducted to look into the novelty effect, and these results should be further discussed.

Studies have shown that as a result of gamification activities, students' problem solving skills [30, 97], cognitive effort [15] and the rate of completing the activities on time [76] have increased. As a result of the interviews with the students in these studies, it was found that a dynamic environment was created by the

191

use of feedback and that this in turn had a positive effect on the results. Moreover, it was emphasized that the task, the required effort, and the time should be managed together. In 13% (*f*=8) of studies investigating academic achievement and performance, students' personality traits [2, 10, 33, 106], player type [28] and the effect of game elements used [8, 19, 73] were examined, and it was seen that these independent variables affected the results. In a study in which learning styles were examined [3], it was revealed that active students had a more positive perception of gamification and individuals with global learning styles performed better in gamified learning activities.

Results on the Affective/Emotional Dimension

In the articles studied, affective skills such as students' motivation, interest, attitude, self-efficacy perception, and anxiety levels were also investigated. In 84% (*f*=33) of the studies examining the motivation of students, it was found that the motivation of the students in the experimental group participating in gamified learning activities was higher than that of those in the control group, and as a result of the questionnaires and tests, it was revealed that the motivation increased with the gamified learning activities [4, 12, 19, 20, 27, 35, 36, 38, 39, 40, 41, 48, 49, 53, 57, 62, 67, 70, 75, 77, 78, 79, 82, 83, 85, 89, 93, 97, 99, 100, 102, 103, 107]. However, in these studies, the importance of careful design of the gamified system was emphasized. It was stated that positive and negative feedback should be well balanced in order not to damage the participants' sense of competence or increase the pressure too much. In 10% (*f*=4) of the studies, it was found that gamified learning activities did not make a significant difference on motivation [31, 60, 86, 92]. In addition, 5% of the studies (*f*=2) stated that motivation actually decreased, whereas in one of these studies [11], it was concluded that motivation decreased initially but then increased, while another research [9] found that extrinsic motivation increased but intrinsic motivation decreased. In these studies, it has been seen that the badges that the students can see themselves show more positive results than the badges that others see. According to the results, while achievement, progressing to the next level, being in the first place on the leaderboard, and the desire to win awards, points, or badges affect motivation positively, in some cases, easily moving to the next level and the complacency brought by achievement can negatively affect motivation. In addition, it was seen that motivation decreased in cases of failing tasks, not being able to move on to the next task or level, not earning a badge, and falling behind the class on the leaderboard. In the studies, it was stated that the difficulty level of the tasks should be appropriate, the students should be supported with feedback and clues when needed, and the leaderboard should be arranged in a way to ensure the continuity of motivation with some rules (e.g., tasks to be completed and badges to be obtained to stay ranked).

In studies, it was concluded that gamification activities increased students' interest [43, 98, 100]. Only one study showed no significant difference [94]. Three studies investigated how gamification affects students' self-efficacy perceptions. While improvement in the perception of self-efficacy was found in two studies [98, 106], no significant difference was observed in the other [63]. In addition, it was observed that the anxiety level of students decreased after participating in gamified activities [2, 64, 90].

Results on the Behavioral Dimension

Students' participation in gamified learning environments, online discussions, competitions, formative assessment activities, and e-learning systems, as well as their acceptance of these systems, course completion rates, and social interaction were investigated in this aspect. In 87% (*f*=26) of the studies examining engagement, it was found that gamified learning environments increased student engagement [4, 5, 7, 10, 14, 15, 18, 19, 22, 23, 26, 35, 40, 43, 44, 47, 50, 52, 55, 59, 65, 78, 80, 83, 94, 108], whereas 6% (*f*=2) of the studies found a decrease [31, 46], and 6% (*f*=2) did not show a significant difference [92, 106]. In addition, in a study [53] it was found that engagement varied according to intrinsic and extrinsic motivation. In this paper, it was concluded that while the student's engagement increased in the activities supporting intrinsic motivation, it decreased in the activities supporting extrinsic motivation. A study investigating the novelty effect on student engagement [57] revealed that there was no novelty effect on the increase in engagement, and that there were students who always used the platform, even during vacation or after graduation.

In the interviews, the students said that they found the learning environment fun, motivating, and interesting, and that the activities aroused a sense of curiosity. Furthermore, the reasons for the decrease in participation were revealed through interviews with students as follows:

- Satisfaction and complacency as a result of the success achieved and being at the top of the leaderboard.
- Lack of motivation: failing missions, failing to advance to the next mission or level, failing to earn badges, and lagging behind the class on the leaderboard.

Certain suggestions have been made in the examined studies regarding the negative situations mentioned above: Tasks and difficulty levels should be determined according to the readiness of students; the levels should gradually get more difficult as they progress; students' curiosity should be strengthened with locked contents; and freedom of choice in tasks and goals should be provided. In the studies, it has been emphasized that such measures to be taken in gamified learning environments can increase the engagement of students by providing both internal and external motivation. In a study that dealt with a system that was constantly updated based on student feedback [78], it was seen that the students in the top three on the leaderboard would be removed from the leaderboard if they did not receive a badge in the next task, and it was concluded that engagement was increased by preventing the sluggishness that occurred.

In a study [57] conducted at a school with a high dropout rate, course completion rates were examined, and it was concluded that the rate of dropping out of school decreased after the implementation of gamified learning activities. Similarly, in another study [79], it was seen that the rate of completing the activities was higher in the experimental group participating in gamified learning activities.

In all of the studies investigating social interaction and classroom atmosphere [16, 70, 88], it was observed that social interaction and group cohesion were high and a positive classroom atmosphere was formed through gamification activities. Moreover, it was also noted that gamification activities improve the sense of community. However, despite the results revealed in these studies, contrary student opinions were also found. Some students stated they did not like being on a team or working in a group, or that they were not satisfied with their teammates. The different personality traits and learning styles of the students may have played a role in these outcomes. In a study investigating social interaction [24], the effect of game elements on interaction was analyzed. It was observed that social interaction was higher in activities with avatars, meaningful stories, and team-play game elements compared to activities using badges, leaderboards, and performance graphics. In addition, one of the results was that competition negatively affected social relations.

Gamification Variables

Results on Player Types

We reviewed a study based on player types [28] in which the Hexad player types (achievers, free spirits, philanthropists, disruptors, players, socializers) were employed (Marczewski, 2015). According to the results, students' performance, motivation, approaches to game elements, and activity choices differed according to player types. Therefore, it was emphasized that player types should be considered in gamification design while including game elements in learning environments.

Results on Game Elements

As a result of the analysis of gamification elements, it was revealed that badges have a positive effect on learning outcomes [24, 25, 73, 85]. When the students discovered the leaderboard, some enthusiasm was observed in their behavior, and among all the game elements, this was the one for which the students showed the most excitement. However, negative results were also obtained from learning outcomes in practice in which this element played an active role [20, 73, 85]. Studies have shown that this element mostly focuses on extrinsic motivation, and therefore the rate of attendance and learning performance are negatively affected [41, 85]. It was observed that students in the top three on the leaderboard had a feeling of complacency, and therefore there was a problem ensuring the continuity of achievement. On the other hand, it was seen that the students in the lower ranks had a feeling of failure, and for this reason, their motivation was negatively affected [19]. However, these results differ between the studies examined in the study. As a matter of fact, in a study in which game elements were examined in detail [8], participants stated that a competitive environment was created with a challenge and leaderboard, and thus they were motivated to participate in both classroom

and online activities. They also stated that difficulties in tasks and levels are required for the continuity of motivation. Students said that the awards increase their participation in online and classroom activities, the supportive messages on the badges increase their self-confidence, and they basically evaluate themselves with the feedback badges that track their progress [25]. In addition, while the participants expressed that they enjoyed working in teams, they also criticized their teams for a number of reasons (teammates, community building). Finally, it was concluded that the social relations levels of the students in the activities with game elements such as avatars, team plays, and meaningful stories were higher compared to the activities in which other game elements were used [24].

Personal Variables

Results on Personal Characteristics

In studies on the effects of personal characteristics; it was observed that traits such as extraversion, conscientiousness, determination, and responsibility had an effect on individuals' gamification perceptions and performances [3, 34, 95]. In studies conducted by gender [2, 10, 34, 61, 95, 106], it has been stated that gender can have an effective effect on individuals' perceptions of game elements. In addition, it was also revealed that gender had an effect on students' engagement in the gamified learning environment. In these studies, it was concluded that the effects of game elements are highly personal and may vary greatly between different students.

DISCUSSIONS AND CONCLUSION

Examining the data reveals that there is a misunderstanding between the terms "gamification" and "game-based learning." Actually, there's a considerable distinction between gamification and game-based learning. While game-based learning aims to provide education through games, gamification does not take on the role of learning. Rather, it emphasizes conducting an entertaining learning process with game elements, increasing student motivation and participation, and overcoming obstacles that arise from time to time. In most of the studies examined, the researchers emphasized the use of game elements in non-game contexts and included features such as motivation, facilitating learning, problem solving, and active participation in their definitions. As a result, when we consider the common features of the definitions, we can define it as the use of fun game elements in non-game contexts that enables students to be active in order to increase learning motivation, student participation, and student performance.

In the articles we examined for our study, Self-Determination Theory was the most frequently used; followed by Flow Theory and Werbach and Hunter's Model. On the other hand, the results of this study showed that no model or theory was used in 61% of the studies. This finding reveals that the theoretical framework of the studies in the field is not based on a strong foundation. Studies in the literature have indicated that the theory has not been empirically examined and applied, as most studies do not refer to any theory, and this creates an important gap that limits the growth of the field as a whole (Huang et al., 2019; Krath et al., 2021; Nacke & Deterding, 2017; Seaborn & Fels, 2015; Zainuddin et al., 2020). In their literature analysis on gamification in education, Zainuddin et al. (2020), Kalogiannakis et al. (2021), and Nadi-Ravandi and Batooli (2022) found that the majority of the studies lacked a theoretical foundation. The findings of this research indicate that the studies primarily relied on theories and models for the development of gamified learning environments. As Sen (2019) stated in his study, motivation and design-based theories have been used more heavily in recent years. However, Park et al. (2019) and Sanchez et al. (2020) emphasized that the theory-based design of gamified learning systems is not given enough attention. Similarly, according to the results of this study, the same problem regarding the theoretical background continues to a large extent in recent studies as well. In future studies, it is important for researchers to consider theory and/or models when designing gamified learning environments. Thus, stronger, more robust, and reproducible results would be obtained. Future research on gamification in education should prioritize the development and utilization of theories and models for the gamification of the learning environment. This requires doing additional investigations, as suggested by Nadi-Ravandi and Batooli (2022) and Zainuddin et al. (2020). Furthermore, it is crucial to highlight the significance of these theories and models, and to thoroughly

analyze their practical implementations within the framework of instructional design models, social learning theories, cognitive and behavioral theories, motivation models, and psychological theories (Nadi-Ravandi and Batooli, 2022). Therefore, in order to create a gamified learning environment that is well-structured, efficient, and beneficial, it is important to consider the psychological and social demands, as well as the personality traits, of the students. Furthermore, conducting an analysis of the social, cognitive, affective, and behavioral impacts of the activities conducted in these learning settings on students can provide study findings that are grounded in robust principles.

When we examine the research methods used in the articles, we see that the research was mostly conducted as quantitative studies, while the qualitative research method was very rarely used. In addition, quantitative studies were carried out mostly as an experimental study. Experimental studies have revealed the potential of gamified learning environments to provide performance, motivation, and student engagement. However, in-depth research that takes into account the gamification elements and individual differences used in studies conducted in various learning environments is still required. At this point, the existing literature shows that gamification, when well designed and used correctly, has the potential to improve learning, but qualitative research is needed to reveal how various game elements should be applied to different learning contexts (Aldemir et al., 2018). Therefore, for the purpose of averting this shortcoming, the gaps that cannot be bridged with quantitative data could as well be eliminated by bringing into play the strengths provided by the use of qualitative data. Subsequent qualitative research may uncover the subjective anticipations, inclinations, encounters, comprehensions, and reflections of students in gamified educational settings from a more comprehensive standpoint (Cook et al., 2022; Licorish et al., 2018; Zou, 2020). Therefore, it is potentially can be feasible to customize the gamified setting by integrating personal attributes, various game components, levels of difficulty, and helpful suggestions. Mixed-methods research yields more thorough and holistic findings within the subject area. Ingleton and Davies (2007) argue that integrating qualitative and quantitative methodologies in a single study enhances the comprehension of different facets of the phenomenon being examined, leading to a more comprehensive knowledge and the development of more well-informed educational policy. Utilizing mixed-methods research in gamification will enhance comprehensiveness by combining quantitative data with the underlying rationales, factors, and reflections influenced by personal experiences. This will provide indicators for assessing the efficacy of gamified learning settings. Consequently, it will offer a diverse array of comprehensive material for educators and instructional designers.

The majority of the studies were conducted in undergraduate educational settings. It is noteworthy that very few studies have been conducted at the pre-school, primary, secondary, and high school levels. It is thought that especially pre-school and primary school students can adapt more to a fun learning environment gamified with game elements, thus increasing their interest and motivation towards learning and providing more effective and permanent learning (Jogo et al., 2022; Kucuk & Sisman, 2017; Wommer et al., 2021). For this reason, further studies at these grade levels and testing these hypotheses will contribute to the field. Researching gamification across diverse educational levels, disciplines, and cultural backgrounds will yield comprehensive insights into its contextual effectiveness. Toda et al. (2020) highlight the scarcity of research on gamification that examines cultural influences. The researchers put forward and assess a model called the Gamification Model for Cultural Studies (GamiCSM) in order to gain a deeper understanding of how cultural aspects and gamification are interconnected in educational contexts.

E-learning environments stand out among the gamified platforms in the studies. The studies conducted in these learning environments investigated variables such as performance, motivation, engagement, completion of performance activities, and dropout rates. According to the results, gamified learning activities increased motivation, performance, and engagement, as well as activity and course completion rates and in addition to decreasing dropout rates. Furthermore, it was concluded that student engagement varied depending on motivation. Particularly, it was observed that participation was higher in activities that provided intrinsic motivation (Buckley & Doyle, 2016). These findings are significant in light of issues in distance education systems such as low participation, failure to complete activities, and dropping out (Behl et al., 2022; Bilgic & Tuzun, 2015; Freitas & Silva, 2020; Guohong et al., 2012; Khaldi et al., 2023).

Literature review also showed that in distance education environments, limited student-student and student-teacher interaction, insufficient feedback, and failure to provide students with the autonomy and flexibility they want can lead to a decrease in students' interest and motivation, and therefore, high participation

cannot be achieved (Celen et al., 2011; de la Pena et al., 2021; Guohong et al., 2012; Khaldi et al., 2023). In addition, the use of game elements that are fun, interesting, motivating, and interactive has been suggested to solve these problems (Amriani et al., 2013; An et al., 2020; Caglar & Kocadere, 2015; de la Pena et al., 2021; Freitas & Silva, 2020; Ozcinar et al., 2021; Sahin et al., 2017). According to Jayalath and Esichaikul (2022), a gamification approach can provide significant benefits by solving the problems of motivation and participation, as well as eliminating student dissatisfaction and boredom, and thus can offer a solution to the problem of high school dropout rates. Similarly, in the study An et al. (2020) conducted with trainers on gamification in MOOCs, most participants expressed interest in gamification and stated that they would prefer to use game elements in their future MOOCs. Interestingly, they also stated that they mostly wanted to gamify their MOOCs to reinforce students' social interactions and retention. In their study, de la Pena et al. (2021) designed a gamification model for university-level distance education and analyzed its results. According to the results, the interaction of the students in the classroom increased, the number of students taking the exam and passing the course increased, and learning improved. Thus, in line with the studies in the literature and the findings of this research, it is revealed that gamified learning environments can be used as an alternative to solve the problems mentioned in distance education. Due to the health measures taken during the COVID-19 epidemic, face-to-face education could not take place, and education activities were carried out using distance education systems (Dennon, 2021). For this reason, the primary concern of educators who use technology as a motivation tool has become the lack of education methods. The difficulties of online education, such as staying motivated, engaging with course content, and participating in classroom activities, have become more pronounced due to social isolation (Nair, 2021; Zainuddin et al., 2021). Gamification, which is proposed as a solution to overcome these difficulties, has gained importance in the distance education process as it helps students internalize the learning content and enrich their learning experiences (Areed et al., 2021; Balci et al., 2022). In this study, it is a remarkable result that the rate of articles published in 2020 and 2021, when the COVID-19 pandemic process was experienced, was 43% (f=47) and 53% (f=25) of these articles were conducted in distance education systems. According to Alzahrani and Alhalafawy (2022), the move to e-learning platforms during the COVID-19 pandemic has increased interest in gamification. Gamification helps students achieve educational goals, assesses their strengths and weaknesses, improves learning, and motivates them to learn, according to their literature review. However, managing a virtual classroom, implementing gamification that doesn't match learners' sensory preferences, boredom from repetitive activities, task complexity, time constraints, negative emotions like anxiety, frustration, and worry, and a lack of internet connectivity are challenges. Phung (2020) found that gamification can cause student boredom, low self-confidence, tension, helplessness, discomfort, hesitation, diversion, and a desire to stop. While not expressly highlighted in the studies, these negative characteristics raise ethical problems such as system manipulation, dishonesty, unhealthy competition, depression, and privacy invasion (Almeida et al., 2023). Potential avenues for future research could involve creating ethical standards for gamification in education.

In the articles we reviewed, we saw that gamified learning environments positively affected students' participation, interest, motivation, and performance. However, the results obtained in studies on gamification differ. Studies have found positive (Dahalan et al., 2023; Dehghanzadeh et al., 2019; Ekici; 2021; Erumit & Yilmaz, 2021; Freitas & Silva, 2020; Hung, 2017; Jayalath & Esichaikul, 2022; Su & Cheng, 2015; Zainuddin et al., 2020) and negative effects (Almeida et al., 2023; Kyewski & Kramer, 2018; Philpott & Son, 2022; Phung, 2020; Van Roy & Zaman, 2019; Tan & Cheah, 2021; Toda et al., 2018) for motivation, performance, retention, or user effectiveness. On the other hand, some studies did not reveal any effect restricted to certain conditions (Attali & Arieli-Attali, 2015; Balci et al., 2022; de Marcos et al., 2014; Hanus & Fox, 2015; Koivisto & Hamari, 2014; Mese & Dursun, 2019). According to de la Pena et al. (2021), gamification is not a guarantee of success because how it is implemented will determine dropout rates and interaction levels. Similarly, Hamari et al. (2014) stated in their literature review that gamification provides an effective learning environment, but there are points to be considered. Leitao et al. (2022), emphasizing that there is no one-size-fits-all model for successful gamification of a learning activity, attributed the mixed findings of the gamification literature to the different designs of applied game design elements and gamification systems.

Use of various items (e.g., leaderboards, charts, narratives, badges), amount of items used (e.g., amount of achievements), visual presentation (e.g., animations, appeal), difficulty (e.g., easy achievements), and

duration of use (e.g., single task, long-term use) are considered important in the gamification process (Groening & Binnewies, 2019). Hamari et al. (2014) mentioned that in most of the studies, the context and the characteristics of the participants came to the fore. Van Roy and Zaman (2018) stated that the effects of game elements are highly personal and may show many differences among different students. In gamified systems, recent research has shown that customizing gamification (according to different aspects such as gender, user type, and pedagogical tasks) can affect users' experiences (positively or negatively) (Denden et al., 2022; Hallifax et al., 2019; Klock et al., 2020; Oliveira et al., 2022; Rodrigues et al., 2020, Tan et al., 2023). In addition, Ding (2019) stated that the effect of the gamification approach on performance may depend on the game elements used. Leitao et al. (2022) discovered that each distinct game element possesses varying levels of potential to enhance motivation. Likewise, Leitao et al. (2021) made a systematic evaluation of each item and observed that the effects of different game features on the learning experience and learning outcomes of the participants varied. Tan and Cheah (2021) concluded that feedback encourages students to stick to the course and continue; rewards further increase the motivation to be successful in practice; on the other hand, a leaderboard negatively affects motivation by increasing stress. They also stated that students' use of usernames instead of names could be beneficial for the negative consequences caused by the leaderboard. Similarly, Mese and Dursun (2019) concluded in their study that the experience score in terms of leaderboard, competitive environment, and level negatively affects motivation. They also observed that there was a decrease in motivation when tasks were not completed and badges were not earned. Kyewski and Kramer (2018) concluded that badges have less impact on motivation and performance than is generally assumed and that students' intrinsic motivation decreases over time. In addition, they determined that badges that can be seen by the students themselves produce more positive results than those that can be seen by others. Almeida et al. (2023) conduct a literature review to establish the connections between game design features and the adverse consequences they can generate. The research findings indicate that the commonly reported negative effects in the studies include lack of influence, deteriorating performance, motivational issues, lack of comprehension, and apathy. Furthermore, game design elements such as badges, leaderboards, competitions, and points were identified as the primary factors contributing to these negative effects. These findings offer insights for educators and instructional designers on how to effectively manage the advantages and disadvantages of the gamification features they employ.

In the study conducted by Denden et al. (2021), the results showed that gender and personality can influence students' perceptions of game elements. Similarly, Smiderle (2020) investigated the effects of gamification on students' learning, behavior, and participation based on their personality traits in a web-based learning environment, and they found that the effect of gamification depends on the specific characteristics of the users. Such that, in their systematic review study, Khaldi et al.'s (2023) classification of gamification approaches reveals the tendency towards personalization in gamification. Hamari et al. (2018) stated that gamification features may be perceived as more important by users who have easier goals, are result-oriented, and are more likely to prove themselves to others. Zahedi et al. (2021) argued that while implementing gamification elements into a learning environment, it is very important to adapt player types to gamification settings, and this issue should be carefully considered based on theories. Buil et al. (2020) present empirical evidence based on Self Determination Theory that uses various game design elements to motivate students and meet their needs for competence, autonomy, and relatedness. This study provides information that lays the groundwork for future research. Denden et al. (2022) pointed out that learners' personality traits and player types should be considered in gamification studies. For this reason, it is very important to consider students' personality traits and learning styles, the gamified learning environment and game elements used, and environmental factors in future research. Thus, deeper and more comprehensive inferences can be made from the obtained results.

Consequently, the implementation of gamification in education and learning enables educators to create an enjoyable learning experience, enabling students to promptly understand learning objectives and actively engage with the social learning environment. Nevertheless, if gamification is not adequately strategized and tailored to user requirements, the outcomes may fall short of expectations, and there is even a possibility of negative repercussions. By designing the gamification environment and doing research on its effectiveness using theories like self-determination theory, flow theory, gamification design models, and learning theories, we may obtain robust and impactful outcomes. The results can offer educators and instructional designers

in-depth insights into how to incorporate gamification into the learning environment using a theoretical framework. Therefore, they have the ability to establish a learning environment that incorporates game elements, which is both efficient and delivers desired outcomes. Providing a gamified learning environment that allows for personalization based on students' individual characteristics, preferences, interests, readiness levels, and perception styles can potentially maintain high levels of student motivation and ensure completion of activities. Furthermore, a thorough assessment of the game features to be incorporated into the system and the extent to which students will be exposed to these aspects can play a crucial role in evaluating the efficacy of gamification. This study indicates that the utilization of various game elements has distinct impacts on study outcomes. By including well-designed gamified learning settings that cater to both individual and social needs, while considering the aforementioned criteria, it is possible to effectively address issues commonly encountered in distant education platforms, such as lack of motivation, boredom, and student attrition. In this study, we examined the research on gamification in education by limiting it to ESCI, SCI, and SSCI-indexed articles published in Science Direct, Taylor Francis Online, and Springer Link databases. Future literature reviews can explore gamification studies in education more broadly by examining articles published in other databases and journals, theses, and papers. Additionally, by focusing on research on gamified learning environment design, it can provide detailed information on how to apply design principles more effectively and how to integrate game elements into the system and curriculum. One of the remarkable results of the research is that gamification can be an effective method to solve problems such as lack of motivation, boredom, and dropping out of the course in distance education. In this regard, potential opportunities and risks can be discussed by examining studies specifically on gamification on distance education platforms.

BIODATA and CONTACT ADDRESSES of AUTHORS

Dr. Duygu GUR has been working as an information technologies teacher in the Ministry of National Education since 2012. She received her PhD degree in the Computer and Instructional Technology Department of Firat University in August 2024. Her academic interest areas are digital parenting, problematic internet use, mobile learning, e-learning, cyber behaviors, educational technologies, the use of gamification in education, and social media. She has over 15 national and international articles and papers submitted to international meetings. She also contributed as a researcher and writer to the development of the 100th Anniversary of the Republic: A Look at the Future in Education Report, published in cooperation with the Council of Higher Education and the Ministry of National Education.

Duygu GUR
Computer and Instructional Technology, Faculty of Education
Address: Firat University, 23100, Elazig, Turkiye.
Phone: +90 5303969346
E-mail: duyguaba@hotmail.com

Prof. Dr. Yalin Kilic TUREL is a professor of instructional technology at the Faculty of Education, Firat University. In 2008, he completed his doctorate in the Department of Educational Sciences at Firat University. During his doctorate, he conducted research at the Department of Instructional Systems at Florida State University in the United States with a Fulbright Doctoral Thesis Research Scholarship for one year (2007-2008). In 2011, he conducted studies at the Learning Systems Institute at Florida State University with a TUBITAK post-doctoral research scholarship. Dr. Turel, who held various administrative positions such as department head and board member between 2013 and 2020, has 41 published articles, 12 book chapter, and more than 80 papers. He successfully served as the Director of Firat University's Technical Sciences Vocational School between 2020 and 2025. He has worked on many national and international projects. Dr. Turel, who has given training in Turkiye and many countries such as Somalia, Tunisia, Kosovo, Iraq, and Pakistan, continues his work on different topics such as

distance education, instructional design, mobile learning, use of technology in special education, interactive whiteboard applications, and use of artificial intelligence in education.

Yalin Kilic TUREL
Computer and Instructional Technology, Faculty of Education
Address: Firat University, 23100, Elazig, Turkiye.
Phone: +90 5325918597
E-mail: yturel@gmail.com

REFERENCES

Aguiar-Castillo, L., Clavijo-Rodriguez, A., Hernandez-Lopez, L., De Saa-Perez, P., & Perez-Jimenez, R. (2021). Gamification and deep learning approaches in higher education. *Journal of Hospitality, Leisure, Sport & Tourism Education*, *29*, 100290.

Albuquerque, J., Bittencourt, I. I., Coelho, J. A. P. M., & Silva, A. P. (2017). Does gender stereotype threat in gamified educational environments cause anxiety? An experimental study. *Computers & Education*, *115*, 161-170. https://doi.org/10.1016/j.compedu.2017.08.005

Aldemir, T., Celik, B., & Kaplan, G. (2018). A qualitative investigation of student perceptions of game elements in a gamified course. *Computers in Human Behavior*, *78*, 235-254. https://doi.org/10.1016/j.chb.2017.10.001

Almeida, C., Kalinowski, M., Uchôa, A., & Feijo, B. (2023). Negative effects of gamification in education software: Systematic mapping and practitioner perceptions. *Information and Software Technology*, *156*, 107142.

Alsadoon, E., Alkhawajah, A., & Suhaim, A. B. (2022). Effects of a gamified learning environment on students' achievement, motivations, and satisfaction. *Heliyon*, *8*(8), e10249.

Alzahrani, F. K. J., & Alhalafawy, W. S. (2022). Benefits and challenges of using gamification across distance learning platforms at higher education: A systematic review of research studies published during the COVID-19 pandemic. *Journal of Positive School Psychology*, *6*(10), 1948-1977.

Amriani, A., Aji, A. F., Utomo, A. Y., & Junus, K. M. (2013). An empirical study of gamification impact on e-Learning environment. In *Proceedings of 2013 3rd international conference on computer science and network technology* (pp. 265-269). IEEE.

An, Y., Zhu, M., Bonk, C. J., & Lin, L. (2020). Exploring instructors' perspectives, practices, and perceived support needs and barriers related to the gamification of MOOCs. *Journal of Computing in Higher Education*, *33*(1), 64-84.

Areed, M. F., Amasha, M. A., Abougalala, R. A., Alkhalaf, S., & Khairy, D. (2021). Developing gamification e-quizzes based on an android app: the impact of asynchronous form. *Education and Information Technologies*, *26*(4), 4857-4878.

Attali, Y., & Arieli-Attali, M. (2015). Gamification in assessment: Do points affect test performance? *Computers & Education*, *83*, 57-63.

Bai, S., Hew, K. F., Sailer, M., & Jia, C. (2021). From top to bottom: How positions on different types of leaderboard may affect fully online student learning performance, intrinsic motivation, and course engagement. *Computers & Education*, *173*, 104297.

Balci, S., Secaur, J. M., & Morris, B. J. (2022). Comparing the effectiveness of badges and leaderboards on academic performance and motivation of students in fully versus partially gamified online physics classes. *Education and Information Technologies*, 1-36.

Basal, A., & Kaynak, N. E. (2020). Perceptions of pre-service English teachers towards the use of digital badges. *Innovations in Education and Teaching International*, *57*(2), 148-162. https://doi.org/10.1080/14703297.2019.1649172

Behl, A., Jayawardena, N., Pereira, V., Islam, N., Del Giudice, M., & Choudrie, J. (2022). Gamification and e-learning for young learners: A systematic literature review, bibliometric analysis, and future research agenda. *Technological Forecasting and Social Change*, *176*, 121445.

Behnamnia, N., Kamsin, A., Ismail, M. A. B., & Hayati, A. (2020). The effective components of creativity in digital game-based learning among young children: A case study. *Children and Youth Services Review*, *116*, 105227.

Bilgic, H. G., & Tuzun, H. (2015). Yuksekogretim kurumlari web tabanli uzaktan egitim programlarinda yasanan sorunlar. *Acikogretim Uygulamalari ve Arastirmalari Dergisi*, *1*(3), 26-50.

Bouchrika, I., Harrati, N., Wanick, V., & Wills, G. (2021). Exploring the impact of gamification on student engagement and involvement with e-learning systems. *Interactive Learning Environments*, *29*(8), 1244-1257.

Buckley, P., & Doyle, E. (2016). Gamification and student motivation. *Interactive Learning Environments*, *24*(6), 1162-1175. https://doi.org/10.1080/10494820.2014.964263

Buckley, P., & Doyle, E. (2017). Individualising gamification: An investigation of the impact of learning styles and personality traits on the efficacy of gamification using a prediction market. *Computers & Education*, *106*, 43-55. https://doi.org/10.1016/j.compedu.2016.11.009

Buil, I., Catalan, S., & Martinez, E. (2020). Understanding applicants' reactions to gamified recruitment. *Journal of Business Research*, *110*, 41-50.

Carrion Candel, E., & Colmenero, M. J. R. (2022). Gamification and mobile learning: innovative experiences to motivate and optimise music content within university contexts. *Music Education Research*, *24*(3), 377-392.

Celen, F. K., Celik, A., & Seferoglu, S. S. (2018). Yuksekogretimde cevrim-ici ogrenme: Sistemde yasanan sorunlar ve cozum onerileri. *Journal of European Education*, *1*(1), 25-34.

Chapman, J. R., & Rich, P. J. (2018). Does educational gamification improve students' motivation? If so, which game elements work best? *Journal of Education for Business*, *93*(7), 315-322. https://doi.org/10.1080/08832323.2018.1490687

Chen, C.-M., Li, M.-C., & Chen, T.-C. (2020). A web-based collaborative reading annotation system with gamification mechanisms to improve reading performance. *Computers & Education*, *144*, 103697. https://doi.org/10.1016/j.compedu.2019.103697

Cheong, C., Cheong, F., & Filippou, J. (2013). Using design science research to incorporate gamification into learning activities. *Pacis 2013 Proceedings*, 1-14.

Chugh, R., & Turnbull, D. (2023). Gamification in Education: A Citation Network Analysis Using CitNetExplorer. *Contemporary Educational Technology*, *15*(2).

Codish, D., & Ravid, G. (2014). Academic course gamification: The art of perceived playfulness. *Interdisciplinary Journal of E-Learning and Learning Objects*, *10*(1), 131-151.

Coffland, D., & Huff, T. (2022). Stats Kwon Do: a Case Study in Instructional Design, Multimedia and Gamification of Instruction. *TechTrends*, *66*(6), 945-956.

Cook, J., Ecker, U. K., Trecek-King, M., Schade, G., Jeffers-Tracy, K., Fessmann, J., ... & McDowell, J. (2023). The cranky uncle game—Combining humor and gamification to build student resilience against climate misinformation. *Environmental Education Research*, *29*(4), 607-623.

Crompton, H., Burke, D., Jordan, K., & Wilson, S. W. (2021). Learning with technology during emergencies: A systematic review of K-12 education. *British Journal of Educational Technology*, *52*(4), 1554-1575.

Cruaud, C. (2018). The playful frame: Gamification in a French-as-a-foreign-language class. *Innovation in Language Learning and Teaching*, *12*(4), 330-343. https://doi.org/10.1080/17501229.2016.1213268

Caglar, S., & Kocadere, S. A. (2015). Cevrimici Ogrenme Ortamlarinda Oyunlastirma. *Journal of Educational Sciences & Practices*, *14*(27).

Cakiroglu, U., Basibuyuk, B., Guler, M., Atabay, M., & Yilmaz Memis, B. (2017). Gamifying an ICT course: Influences on engagement and academic performance. *Computers in Human Behavior*, *69*, 98-107. https://doi.org/10.1016/j.chb.2016.12.018

Celik, F., & Yangin-Ersanli, C. (2022). The use of augmented reality in a gamified CLIL lesson and students' achievements and attitudes: a quasi-experimental study. *Smart Learning Environments*, *9*(1), 1-18.

Dahalan, F., Alias, N., & Shaharom, M. S. N. (2023). Gamification and Game Based Learning for Vocational Education and Training: A Systematic Literature Review. *Education and Information Technologies*, 1-39.

Dapica, R., Hernandez, A., & Peinado, F. (2022). Who trains the trainers? Gamification of flight instructor learning in evidence-based training scenarios. *Entertainment Computing*, *43*, 100510.

de la Pena Esteban, F. D., Lara Torralbo, J. A., Lizcano Casas, D., & Burgos Garcia, M. C. (2020). Web gamification with problem simulators for teaching engineering. *Journal of Computing in Higher Education*, *32*(1), 135-161. https://doi.org/10.1007/s12528-019-09221-2

de la Pena, D., Lizcano, D., & Martinez-Alvarez, I. (2021). Learning through play: Gamification model in university-level distance learning. *Entertainment Computing*, *39*, 100430.

Dehghanzadeh, H., Fardanesh, H., Hatami, J., Talaee, E., & Noroozi, O. (2021). Using gamification to support learning English as a second language: a systematic review. *Computer Assisted Language Learning*, *34*(7), 934-957.

de-Marcos, L., Garcia-Lopez, E., & Garcia-Cabot, A. (2016). On the effectiveness of game-like and social approaches in learning: Comparing educational gaming, gamification & social networking. *Computers & Education*, *95*, 99-113. https://doi.org/10.1016/j.compedu.2015.12.008

de-Marcos, L., Garcia-Lopez, E., Garcia-Cabot, A., Medina-Merodio, J.-A., Dominguez, A., Martinez-Herraiz, J.-J., & Diez-Folledo, T. (2016). Social network analysis of a gamified e-learning course: Small-world phenomenon and network metrics as predictors of academic performance. *Computers in Human Behavior*, *60*, 312-321. https://doi.org/10.1016/j.chb.2016.02.052

Denden, M., Tlili, A., Chen, N. S., Abed, M., Jemni, M., & Essalmi, F. (2022). The role of learners' characteristics in educational gamification systems: a systematic meta-review of the literature. *Interactive Learning Environments*, 1-23.

Denden, M., Tlili, A., Essalmi, F., Jemni, M., Chen, N. S., & Burgos, D. (2021). Effects of gender and personality differences on students' perception of game design elements in educational gamification. *International Journal of Human-Computer Studies*, *154*, 102674.

Dennon, A. (2021). Coronavirus impacts on students and online learning. *BestColleges. Retrieved December*, *3*, 2021.

Ding, L. (2019). Applying gamifications to asynchronous online discussions: A mixed methods study. *Computers in Human Behavior*, *91*, 1-11. https://doi.org/10.1016/j.chb.2018.09.022

Ding, L., Er, E., & Orey, M. (2018). An exploratory study of student engagement in gamified online discussions. *Computers & Education*, *120*, 213-226. https://doi.org/10.1016/j.compedu.2018.02.007

Ding, L., Kim, C., & Orey, M. (2017). Studies of student engagement in gamified online discussions. *Computers & Education*, *115*, 126-142. https://doi.org/10.1016/j.compedu.2017.06.016

Dominguez, A., Saenz-de-Navarrete, J., De-Marcos, L., Fernandez-Sanz, L., Pages, C., & Martinez-Herraiz, J. J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers & Education*, *63*, 380-392.

Dong, T., Dontcheva, M., Joseph, D., Karahalios, K., Newman, M., & Ackerman, M. (2012). Discovery-based games for learning software. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 2083-2086).

Donnermann, M., Lein, M., Messingschlager, T., Riedmann, A., Schaper, P., Steinhaeusser, S., & Lugrin, B. (2021). Social robots and gamification for technology supported learning: An empirical study on engagement and motivation. *Computers in Human Behavior*, *121*, 106792.

Doumanis, I., Economou, D., Sim, G. R., & Porter, S. (2019). The impact of multimodal collaborative virtual environments on learning: A gamified online debate. *Computers & Education*, *130*, 121-138. https://doi.org/10.1016/j.compedu.2018.09.017

Dugnol-Menendez, J., Jimenez-Arberas, E., Ruiz-Fernandez, M. L., Fernandez-Valera, D., Mok, A., & Merayo-Lloves, J. (2021). A collaborative escape room as gamification strategy to increase learning motivation and develop curricular skills of occupational therapy students. *BMC Medical Education*, *21*(1), 1-13.

Ekici, M. (2021). A systematic review of the use of gamification in flipped learning. *Education and Information Technologies*, *26*(3), 3327-3346.

Erumit, S. F., & Yilmaz, T. K. (2021). The happy association of game and gamification: the use and evaluation of game elements with game-based activities. *Technology, Pedagogy and Education*, *31*(1), 103-121.

Eryigit, G., Bektas, F., Ali, U., & Dereli, B. (2021). Gamification of complex morphology learning: the case of Turkish. *Computer Assisted Language Learning*, 1-29.

Fernandez-Antolin, M.-M., del Rio, J. M., & Gonzalez-Lezcano, R.-A. (2020). The use of gamification in higher technical education: Perception of university students on innovative teaching materials. *International Journal of Technology and Design Education*. https://doi.org/10.1007/s10798-020-09583-0

Fitz-Walter, Z., Tjondronegoro, D., & Wyeth, P. (2011). Orientation passport: using gamification to engage university students. In *Proceedings of the 23rd Australian computer-human interaction conference* (122-125).

Foroutan Far, F., & Taghizadeh, M. (2022). Comparing the effects of digital and non-digital gamification on EFL learners' collocation knowledge, perceptions, and sense of flow. *Computer Assisted Language Learning*, 1-33.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of educational research*, *74*(1), 59-109.

Garcia-Sanjuan, F., Jurdi, S., Jaen, J., & Nacher, V. (2018). Evaluating a tactile and a tangible multi-tablet gamified quiz system for collaborative learning in primary education. *Computers & Education*, *123*, 65-84. https://doi.org/10.1016/j.compedu.2018.04.011

Gehring, K. S., & Marshall, E. (2022). Ready Player One: Gamification of a Criminal Justice Course. *Journal of Criminal Justice Education*, 1-25.

Grangeia, T. de A. G., de Jorge, B., Cecilio-Fernandes, D., Tio, R. A., & de Carvalho-Filho, M. A. (2019). Learn+Fun! Social Media and Gamification sum up to Foster a Community of Practice during an Emergency Medicine Rotation. *Health Professions Education*, *5*(4), 321-335. https://doi.org/10.1016/j.hpe.2018.11.001

Grijalvo, M., Segura, A., & Nunez, Y. (2022). Computer-based business games in higher education: A proposal of a gamified learning framework. *Technological Forecasting and Social Change*, *178*, 121597.

Groening, C., & Binnewies, C. (2019). "Achievement unlocked!"—The impact of digital achievements as a gamification element on motivation and performance. *Computers in Human Behavior*, *97*, 151-166. https://doi.org/10.1016/j.chb.2019.02.026

Guohong, G., Ning, L., Wenxian, X., & Wenlong, W. (2012). The study on the development of internet-based distance education and problems. *Energy Procedia*, *17*, 1362-1368.

Hallifax, S., Serna, A., Marty, J. C., & Lavoue, E. (2019). Adaptive gamification in education: A literature review of current trends and developments. In *European conference on technology enhanced learning* (pp. 294-307). Springer, Cham.

Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work?--a literature review of empirical studies on gamification. In *2014 47th Hawaii international conference on system sciences* (pp. 3025-3034). IEEE.

Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & Education*, *80*, 152-161.

Haruna, H., Zainuddin, Z., Okoye, K., Mellecker, R. R., Hu, X., Chu, S. K. W., & Hosseini, S. (2021). Improving instruction and sexual health literacy with serious games and gamification interventions: an outlook to students' learning outcomes and gender differences. *Interactive Learning Environments*, 1-19.

Hassan, M. A., Habiba, U., Majeed, F., & Shoaib, M. (2019). Adaptive gamification in e-learning based on students' learning styles. *Interactive Learning Environments*, 1-21. https://doi.org/10.1080/10494 820.2019.1588745

Ho, J. (2019). Gamifying the flipped classroom: How to motivate Chinese ESL learners? *Innovation in Language Learning and Teaching*, 1-15. https://doi.org/10.1080/17501229.2019.1614185

Hong, J. C., Hwang, M. Y., Liu, Y. H., & Tai, K. H. (2022). Effects of gamifying questions on English grammar learning mediated by epistemic curiosity and language anxiety. *Computer Assisted Language Learning*, *35*(7), 1458-1482.

Huang, B., & Hew, K. F. (2018). Implementing a theory-driven gamification model in higher education flipped courses: Effects on out-of-class activity completion and quality of artifacts. *Computers & Education*, *125*, 254-272. https://doi.org/10.1016/j.compedu.2018.06.018

Huang, B., Hew, K. F., & Lo, C. K. (2019). Investigating the effects of gamification-enhanced flipped learning on undergraduate students' behavioral and cognitive engagement. *Interactive Learning Environments*, *27*(8), 1106-1126. https://doi.org/10.1080/10494820.2018.1495653

Huang, B., Hwang, G.-J., Hew, K. F., & Warning, P. (2019). Effects of gamification on students' online interactive patterns and peer-feedback. *Distance Education*, *40*(3), 350-379. https://doi.org/10.10 80/01587919.2019.1632168

Hung, H.-T. (2017). Clickers in the flipped classroom: Bring your own device (BYOD) to promote student learning. *Interactive Learning Environments*, *25*(8), 983-995. https://doi.org/10.1080/10494820. 2016.1240090

Ingleton, C., & Davies, S. (2007). Mixed methods for evaluation research. *Addington-Hall J et al*, 191-209.

Jagust, T., Boticki, I., & So, H.-J. (2018). Examining competitive, collaborative and adaptive gamification in young learners' math learning. *Computers & Education*, *125*, 444-457. https://doi.org/10.1016/j. compedu.2018.06.022

Jarnac de Freitas, M., & Mira da Silva, M. (2020). Systematic literature review about gamification in MOOCs. *Open Learning: The Journal of Open, Distance and e-Learning*, 1-23.

Jayalath, J., & Esichaikul, V. (2022). Gamification to enhance motivation and engagement in blended eLearning for technical and vocational education and training. *Technology, Knowledge and Learning*, *27*(1), 91-118.

Jodoi, K., Takenaka, N., Uchida, S., Nakagawa, S., & Inoue, N. (2021). Developing an active-learning app to improve critical thinking: item selection and gamification effects. *Heliyon*, *7*(11), e08256.

Jogo, D. A., Challco, G. C., Bittencourt, I. I., Reis, M., Silva, L. R., & Isotani, S. (2022). Investigating how gamified syllabic literacy impacts learning, flow and inappropriate behaviors: a single-subject study design. *International Journal of Child-Computer Interaction*, *33*, 100458.

Kalogiannakis, M., Papadakis, S., & Zourmpakis, A. I. (2021). Gamification in science education. A systematic review of the literature. *Education sciences*, *11*(1), 22.

Kapp, K. M. (2012). *The gamification of learning and instruction: game-based methods and strategies for training and education*. John Wiley & Sons.

Kauppinen, A., & Choudhary, A. I. (2021). Gamification in entrepreneurship education: A concrete application of Kahoot!. *The International Journal of Management Education*, *19*(3), 100563.

Kenny, R. F., Gunter, G. A., & Campbell, L. O. (2017). Teachers' Assessment of the Instructional Efficacy of Mobile Apps: A Formative Case Study. *Journal of Formative Design in Learning*, *1*(1), 56-63. https://doi.org/10.1007/s41686-017-0003-3

Khaldi, A., Bouzidi, R., & Nader, F. (2023). Gamification of e-learning in higher education: A systematic literature review. *Smart Learning Environments*, *10*(1), 10.

Kim, B., Park, H., & Baek, Y. (2009). Not just fun, but serious strategies: Using meta-cognitive strategies in game-based learning. *Computers & Education*, *52*(4), 800-810.

Klock, A. C. T., Gasparini, I., Pimenta, M. S., & Hamari, J. (2020). Tailored gamification: A review of literature. *International Journal of Human-Computer Studies*, *144*, 102495.

Koivisto, J., & Hamari, J. (2014). Demographic differences in perceived benefits from gamification. *Computers in Human Behavior*, *35*, 179-188.

Koivisto, J., & Hamari, J. (2019). The rise of motivational information systems: A review of gamification research. *International Journal of Information Management*, *45*, 191-210. https://doi.org/10.1016/j.ijinfomgt.2018.10.013

Kopcha, T. J., Ding, L., Neumann, K. L., & Choi, I. (2016). Teaching Technology Integration to K-12 Educators: A 'Gamified' Approach. *TechTrends*, *60*(1), 62-69. https://doi.org/10.1007/s11528-015-0018-z

Krath, J., Schurmann, L., & Von Korflesch, H. F. (2021). Revealing the theoretical basis of gamification: A systematic review and analysis of theory in research on gamification, serious games and game-based learning. *Computers in Human Behavior*, *125*, 106963.

Kucuk, S., & Sisman, B. (2017). Behavioral patterns of elementary students and teachers in one-to-one robotics instruction. *Computers & Education*, *111*, 31-43.

Kulhanek, A., Butler, B., & Bodnar, C. A. (2021). Motivating first-year engineering students through gamified homework. *Educational Action Research*, *29*(5), 681-706.

Kyewski, E., & Kramer, N. C. (2018). To gamify or not to gamify? An experimental field study of the influence of badges on motivation, activity, and performance in an online learning course. *Computers & Education*, *118*, 25-37.

Lavoue, E., Ju, Q., Hallifax, S., & Serna, A. (2021). Analyzing the relationships between learners' motivation and observable engaged behaviors in a gamified learning environment. *International Journal of Human-Computer Studies*, *154*, 102670.

Legaki, N. Z., Karpouzis, K., Assimakopoulos, V., & Hamari, J. (2021). Gamification to avoid cognitive biases: An experiment of gamifying a forecasting course. *Technological Forecasting and Social Change*, *167*, 120725.

Legaki, N. Z., Xi, N., Hamari, J., Karpouzis, K., & Assimakopoulos, V. (2020). The effect of challenge-based gamification on learning: An experiment in the context of statistics education. *International journal of human-computer studies*, *144*, 102496.

Leitão, R., Maguire, M., Turner, S., & Guimarães, L. (2022). A systematic evaluation of game elements effects on students' motivation. *Education and Information Technologies*, *27*(1), 1081-1103.

Leitão, R., Maguire, M., Turner, S., Arenas, F., & Guimarães, L. (2021). Ocean literacy gamified: A systematic evaluation of the effect of game elements on students' learning experience. *Environmental Education Research*, *28*(2), 276-294.

Licorish, S. A., Owen, H. E., Daniel, B., & George, J. L. (2018). Students' perception of Kahoot!'s influence on teaching and learning. *Research and Practice in Technology Enhanced Learning*, *13*(1), 1-23.

Lo, C. K., & Hew, K. F. (2020). A comparison of flipped learning with gamification, traditional learning, and online independent study: the effects on students' mathematics achievement and cognitive engagement. *Interactive Learning Environments*, *28*(4), 464-481.

Lopez, C. E., & Tucker, C. S. (2019). The effects of player type on performance: A gamification case study. *Computers in Human Behavior*, *91*, 333-345. https://doi.org/10.1016/j.chb.2018.10.005

Marczewski, A.C., 2015. Even Ninja Monkeys like to play. CreateSpace Indep. Publish Platform, Charleston.

Mese, C., & Dursun, O. O. (2019). Effectiveness of gamification elements in blended learning environments. *Turkish Online Journal of Distance Education*, *20*(3), 119-142.

Mese, C., & Dursun, O. O. (2018). Oyunlastirma Bilesenlerinin Duygu, Ilgi ve Cevrimici Katilima Etkisi. *Egitim Ve Bilim*, *43*(196), Article 196. https://doi.org/10.15390/EB.2018.7726

Millis, K., Forsyth, C., Wallace, P., Graesser, A. C., & Timmins, G. (2017). The Impact of Game-Like Features on Learning from an Intelligent Tutoring System. *Technology, Knowledge and Learning*, *22*(1), 1-22. https://doi.org/10.1007/s10758-016-9289-5

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., ... & Stewart, L. A. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic reviews*, *4*(1), 1-9.

Molero, D., Schez-Sobrino, S., Vallejo, D., Glez-Morcillo, C., & Albusac, J. (2021). A novel approach to learning music and piano based on mixed reality and gamification. *Multimedia Tools and Applications*, *80*(1), 165-186.

Mora, A., Riera, D., Gonzalez, C., & Arnedo-Moreno, J. (2017). Gamification: a systematic review of design frameworks. *Journal of Computing in Higher Education*, *29*, 516-548.

Murillo-Zamorano, L. R., Lopez Sanchez, J. A., Godoy-Caballero, A. L., & Bueno Munoz, C. (2021). Gamification and active learning in higher education: is it possible to match digital society, academia and students' interests?. *International Journal of Educational Technology in Higher Education*, *18*(1), 1-27.

Nacke, L. E., & Deterding, C. S. (2017). The maturing of gamification research. *Computers in Human Behaviour*, 450-454.

Nadi-Ravandi, S., & Batooli, Z. (2022). Gamification in education: A scientometric, content and co-occurrence analysis of systematic review and meta-analysis articles. *Education and Information Technologies*, *27*(7), 10207-10238.

Nair, B. B. (2022). Endorsing gamification pedagogy as a helpful strategy to offset the COVID-19 induced disruptions in tourism education. *Journal of Hospitality, Leisure, Sport & Tourism Education*, *30*, 100362.

Nair, S., & Mathew, J. (2021). Evaluation of gamified training A Solomon Four-Group Analysis of the Impact of Gamification on Learning Outcomes. *TechTrends*, *65*(5), 750-759.

Ofosu-Ampong, K. (2020). The shift to gamification in education: A review on dominant issues. *Journal of Educational Technology Systems*, *49*(1), 113-137.

Oliveira, W., Hamari, J., Shi, L., Toda, A. M., Rodrigues, L., Palomino, P. T., & Isotani, S. (2022). Tailored gamification in education: A literature review and future agenda. *Education and Information Technologies*, 1-34.

Orhan-Goksun, D., & Gursoy, G. (2019). Comparing success and engagement in gamified learning experiences via Kahoot and Quizizz. *Computers & Education*, *135*, 15-29. https://doi.org/10.1016/j.compedu.2019.02.015

Ozdener, N. (2018). Gamification for enhancing Web 2.0 based educational activities: The case of pre-service grade school teachers using educational Wiki pages. *Telematics and Informatics*, *35*(3), 564-578. https://doi.org/10.1016/j.tele.2017.04.003

Ozkan, Z., & Samur, Y. (2017). Oyunlastirma Yonteminin Ogrencilerin Motivasyonlari Uzerine Etkisi. *Ege Egitim Dergisi*, 857-886. https://doi.org/10.12984/egeefd.314801

Pakinee, A., & Puritat, K. (2021). Designing a gamified e-learning environment for teaching undergraduate ERP course based on big five personality traits. *Education and Information Technologies*, *26*(4), 4049-4067.

Park, J., Liu, D., Yi, M. Y., & Santhanam, R. (2019). GAMESIT: A gamified system for information technology training. *Computers & Education*, *142*, 103643. https://doi.org/10.1016/j.compedu.2019.103643

Parry-Cruwys, D., & MacDonald, J. (2021). Using gamification to promote accurate data entry of practicum experience hours in graduate students. *Behavior Analysis in Practice*, *14*(1), 1-10.

Philpott, A., & Son, J. B. (2022). Leaderboards in an EFL course: Student performance and motivation. *Computers & Education*, *190*, 104605.

Phung, Q. D. (2020). *The negative effect of Gamification in E-learning in the eyes of University students* [Unpublished Master's Thesis]. Jonkoping University, Sweden.

Polito, G., & Temperini, M. (2021). A gamified web based system for computer programming learning. *Computers and Education: Artificial Intelligence*, *2*, 100029.

Prados Sanchez, G., Cozar-Gutierrez, R., del Olmo-Munoz, J., & Gonzalez-Calero, J. A. (2021). Impact of a gamified platform in the promotion of reading comprehension and attitudes towards reading in primary education. *Computer Assisted Language Learning*, 1-25.

Putz, L.-M., Hofbauer, F., & Treiblmaier, H. (2020). Can gamification help to improve education? Findings from a longitudinal study. *Computers in Human Behavior*, *110*, 106392. https://doi.org/10.1016/j.chb.2020.106392

Rachels, J. R., & Rockinson-Szapkiw, A. J. (2018). The effects of a mobile gamification app on elementary students' Spanish achievement and self-efficacy. *Computer Assisted Language Learning*, *31*(1-2), 72-89. https://doi.org/10.1080/09588221.2017.1382536

Ramirez-Donoso, L., Perez-Sanagustin, M., Neyem, A., Alario-Hoyos, C., Hilliger, I., & Rojos, F. (2021). Fostering the use of online learning resources: results of using a mobile collaboration tool based on gamification in a blended course. *Interactive Learning Environments*, 1-15.

Recabarren, M., Corvalan, B., & Villegas, M. (2021). Exploring the differences between gamer and non-gamer students in the effects of gamification on their motivation and learning. *Interactive Learning Environments*, 1-14.

Rodrigues, L., Toda, A. M., Palomino, P. T., Oliveira, W., & Isotani, S. (2020). Personalized gamification: A literature review of outcomes, experiments, and approaches. In *Eighth international conference on technological ecosystems for enhancing multiculturality* (pp. 699-706).

Rosa-Castillo, A., Garcia-Panella, O., Maestre-Gonzalez, E., Pulpon-Segura, A., Rosello-Novella, A., & Sola-Pola, M. (2022). Gamification on Instagram: Nursing students' degree of satisfaction with and perception of learning in an educational game. *Nurse Education Today*, *118*, 105533.

Ruiz-Banuls, M., Gomez-Trigueros, I. M., Rovira-Collado, J., & Rico-Gomez, M. L. (2021). Gamification and transmedia in interdisciplinary contexts: A didactic intervention for the primary school classroom. *Heliyon*, *7*(6), e07374.

Sailer, M., Hense, J. U., Mayr, S. K., & Mandl, H. (2017). How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. *Computers in Human Behavior*, *69*, 371-380. https://doi.org/10.1016/j.chb.2016.12.033

Sanchez, D. R., Langer, M., & Kaur, R. (2020). Gamification in the classroom: Examining the impact of gamified quizzes on student learning. *Computers & Education*, *144*, 103666. https://doi.org/10.1016/j.compedu.2019.103666

Seaborn, K., & Fels, D. I. (2015). Gamification in theory and action: A survey. *International Journal of Human-Computer Studies*, *74*, 14-31.

Seidlein, A. H., Bettin, H., Franikowski, P., & Salloch, S. (2020). Gamified E-learning in medical terminology: the TERMInator tool. *BMC medical education*, *20*, 1-10.

Shortt, M., Tilak, S., Kuznetcova, I., Martens, B., & Akinkuolie, B. (2021). Gamification in mobile-assisted language learning: A systematic review of Duolingo literature from public release of 2012 to early 2020. *Computer Assisted Language Learning*, 1-38.

Smiderle, R., Rigo, S. J., Marques, L. B., Pecanha de Miranda Coelho, J. A., & Jaques, P. A. (2020). The impact of gamification on students' learning, engagement and behavior based on their personality traits. *Smart Learning Environments*, *7*(1), 1-11.

Sotos-Martinez, V. J., Ferriz-Valero, A., Garcia-Martinez, S., & Tortosa-Martinez, J. (2022). The effects of gamification on the motivation and basic psychological needs of secondary school physical education students. *Physical Education and Sport Pedagogy*, 1-17.

Stoeffler, K., Rosen, Y., Bolsinova, M., & von Davier, A. A. (2020). Gamified performance assessment of collaborative problem solving skills. *Computers in Human Behavior*, *104*, 106036.

Su, C. H., & Cheng, C. H. (2015). A mobile gamification learning system for improving the learning motivation and achievements. *Journal of Computer Assisted Learning*, *31*(3), 268-286.

Sahin, M., & Samur, Y. (2017). Dijital cagda bir ogretim yontemi: Oyunlastirma. *Ege Egitim Teknolojileri Dergisi*, *1*(1), 1-27.

Sahin, Y. L., Karadag, N., Bozkurt, A., Dogan, E., Kilinc, H., Ugur, S., Gumus, S., Ozturk, A., & Guler, C. (2017). The Use of Gamification in Distance Education: A Web-Based Gamified Quiz Application. *Turkish Online Journal of Qualitative Inquiry*, *8*(4), 372-395. https://doi.org/10.17569/tojqi.329742

Sen, B. (2019). Oyunlastirma temelli mobil uygulamalarda arayuz tasarimi (Unpublished Master›s thesis), *Isik* Universitesi*, Istanbul.*

Tan D. Y. & Cheah, C. W. (2021). Developing a gamified AI-enabled online learning application to improve students' perception of university physics. *Computers and Education: Artificial Intelligence*, *2*, 100032.

Tan, W. K., Sunar, M. S., & Goh, E. S. (2023). Analysis of the college underachievers' transformation via gamified learning experience. *Entertainment Computing*, *44*, 100524.

Tao, Y., & Zou, B. (2021). Students' perceptions of the use of Kahoot! in English as a foreign language classroom learning context. *Computer Assisted Language Learning*, 1-20.

Tenorio, T., Bittencourt, I. I., Isotani, S., Pedro, A., & Ospina, P. (2016). A gamified peer assessment model for on-line learning environments in a competitive context. *Computers in Human Behavior*, *64*, 247-263. https://doi.org/10.1016/j.chb.2016.06.049

Toda, A., Klock, A. C. T., Palomino, P. T., Rodrigues, L., Oliveira, W., Stewart, C., ... & Isotani, S. (2020, October). GamiCSM: relating education, culture and gamification-a link between worlds. In *Proceedings of the 19th Brazilian Symposium on Human Factors in Computing Systems* (pp. 1-10).

Tsay, C. H.-H., Kofinas, A., & Luo, J. (2018). Enhancing student learning experience with technology-mediated gamification: An empirical study. *Computers & Education*, *121*, 1-17. https://doi.org/10.1016/j.compedu.2018.01.009

Ulmer, J., Braun, S., Cheng, C. T., Dowey, S., & Wollert, J. (2022). Gamification of Virtual Reality assembly training: Effects of a combined point and level system on motivation and training results. *International Journal of Human-Computer Studies*, 102854.

Uz Bilgin, C., & Gul, A. (2020). Investigating the Effectiveness of Gamification on Group Cohesion, Attitude, and Academic Achievement in Collaborative Learning Environments. *TechTrends*, *64*(1), 124-136. https://doi.org/10.1007/s11528-019-00442-x

Valenzuela-Pascual, F., Pamies-Fabra, J., Garcia-Martinez, E., Martinez-Navarro, O., Climent-Sanz, C., Gea-Sanchez, M., ... & Blanco-Blanco, J. (2022). Use of a gamified website to increase pain neurophysiology knowledge and improve satisfaction and motivation among students studying for a degree in physiotherapy: a quasi-experimental study. *BMC Medical Education*, *22*(1), 1-9.

van Roy, R., & Zaman, B. (2018). Need-supporting gamification in education: An assessment of motivational effects over time. *Computers & Education*, *127*, 283-297. https://doi.org/10.1016/j.compedu.2018.08.018

van Roy, R., & Zaman, B. (2019). Unravelling the ambivalent motivational power of gamification: A basic psychological needs perspective. *International Journal of Human-Computer Studies*, *127*, 38-50. https://doi.org/10.1016/j.ijhcs.2018.04.009

Walker, J., Heudebert, J. P., Patel, M., Cleveland, J. D., Westfall, A. O., Dempsey, D. M., ... & Lee, R. (2022). Leveraging Technology and Gamification to Engage Learners in a Microbiology Curriculum in Undergraduate Medical Education. *Medical Science Educator*, 1-7.

Wommer, F. G. B., Sepel, L. M. N., & Loreto, E. L. S. (2021). Insects GO: a gaming activity for entomology teaching in middle school. *Research in Science & Technological Education*, 1-15.

Wu, Y.-L. (2018). Gamification design: A comparison of four m-learning courses. *Innovations in Education and Teaching International*, *55*(4), 470-478. https://doi.org/10.1080/14703297.2016.1250662

Yilmaz, E., & Cagiltay, K. (2004). Elektronik oyunlar ve Turkiye. *TBD 21. Ulusal Bilisim Kurultayi*.

Yildiz, I., Topcu, E., & Kaymakci, S. (2021). The effect of gamification on motivation in the education of pre-service social studies teachers. *Thinking Skills and Creativity*, *42*, 100907.

Zahedi, L., Batten, J., Ross, M., Potvin, G., Damas, S., Clarke, P., & Davis, D. (2021). Gamification in education: A mixed-methods study of gender on computer science students' academic performance and identity development. *Journal of Computing in Higher Education*, *33*(2), 441-474.

Zainuddin, Z. (2018). Students' learning performance and perceived motivation in gamified flipped-class instruction. *Computers & Education*, *126*, 75-88. https://doi.org/10.1016/j.compedu.2018.07.003

Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020). The impact of gamification on learning and instruction: A systematic review of empirical evidence. *Educational Research Review*, *30*, 100326. https://doi.org/10.1016/j.edurev.2020.100326

Zainuddin, Z., Farida, R., Keumala, C. M., Kurniawan, R., & Iskandar, H. (2021). Synchronous online flip learning with formative gamification quiz: instruction during COVID-19. *Interactive Technology and Smart Education*.

Zainuddin, Z., Shujahat, M., Haruna, H., & Chu, S. K. W. (2020). The role of gamified e-quizzes on student learning and engagement: An interactive gamification solution for a formative assessment system. *Computers & Education*, *145*, 103729. https://doi.org/10.1016/j.compedu.2019.103729

Zatarain Cabada, R., Barron Estrada, M. L., Rios Felix, J. M., & Alor Hernandez, G. (2018). A virtual environment for learning computer coding using gamification and emotion recognition. *Interactive Learning Environments*, 1-16. https://doi.org/10.1080/10494820.2018.1558256

Zeybek, N., & Saygi, E. (2024). Gamification in education: Why, where, when, and how?—a systematic review. *Games and Culture*, *19*(2), 237-264.

Zhao, J., Hwang, G. J., Chang, S. C., Yang, Q. F., & Nokkaew, A. (2021). Effects of gamified interactive e-books on students' flipped learning performance, motivation, and meta-cognition tendency in a mathematics course. *Educational Technology Research and Development*, *69*(6), 3255-3280.

Zou, D. (2020). Gamified flipped EFL classroom for primary education: Student and teacher perceptions. *Journal of Computers in Education*. https://doi.org/10.1007/s40692-020-00153-w