



www.ijtes.net

A Descriptive Analysis of the Literature on Educational Games Published Between 1965 and 2019

Hüseyin Yaşar 
Sakarya University, Turkey

Mubin Kiyıcı 
Sakarya University, Turkey

To cite this article:

Yasar, H., & Kiyici, M. (2021). A descriptive analysis of the literature on educational games published between 1965 and 2019. *International Journal of Technology in Education and Science (IJTES)*, 5(2), 258-276. <https://doi.org/10.46328/ijtes.229>

The International Journal of Technology in Education and Science (IJTES) is a peer-reviewed scholarly online journal. This article may be used for research, teaching, and private study purposes. Authors alone are responsible for the contents of their articles. The journal owns the copyright of the articles. The publisher shall not be liable for any loss, actions, claims, proceedings, demand, or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of the research material. All authors are requested to disclose any actual or potential conflict of interest including any financial, personal or other relationships with other people or organizations regarding the submitted work.



This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.



International Journal of Technology in Education and Science (IJTES) is affiliated with **[International Society for Technology, Education, and Science \(ISTES\): www.istes.org](http://www.istes.org)**

A Descriptive Analysis of the Literature on Educational Games Published Between 1965 and 2019

Hüseyin Yaşar, Mübin Kıyıcı

Article Info

Article History

Received:

13 September 2020

Accepted:

03 February 2021

Keywords

Educational games

Instruction methods

Learning activities

Simulations

Classroom activities

Abstract

In the present study, the studies conducted on educational games between 1965 and 2019 were analyzed to determine the trends in research based on the year of publication, topic, publication type, country, target audience and the concepts included in the study title. In the study, 7141 studies that were accessed with "educational games" keyword on the ERIC (Education Resources Information Center) database were analyzed. The abstract data were classified by a software developed by the authors for analysis and the analysis was conducted in two stages. First, the studies on educational games were examined as a group, and then the most studied topics were analyzed separately. The study findings demonstrated that the number of studies on educational games was the highest in 2016 and the prominent topics included instructional methods, learning activities, simulations, and classroom activities. It was determined that digital games were investigated as a type of educational games extensively in studies conducted since 2000, the major type of publication was journal articles, and Australia was the leading country in publications. It was determined that practitioners were the major audience until 2000, and the studies on teachers were prominent since. It was determined that the most frequent concepts in study titles included learning, instruction, simulation, school, game-based, design, computer, science, and mathematics and games, respectively.

Introduction

Throughout the history of humankind, humans always played various games based on the available facilities to have fun and socialize (Yılmaz, 2015). One of the oldest known games, "Mangala" was played about 5000 years ago, and remains of this game called "Senet" in Ancient Egypt were discovered (Piccione, 1980). The earliest findings about games include Roman artifacts such as marbles, peg tops, and anklebones (Fox & Verhovsek, 2002). Due to the advances in information and communication technologies, the global transformation also affected the field of games. Popularization of computer and internet games accelerated the game preference trends among children and adults (Kuzu & Çankaya, 2010). Even traditional games such as backgammon, chess and rummikub are among the entertainment options available in digital media today (Yılmaz, 2015).

The literature on games has adopted various approaches and definitions (Abt, 1987; Huizinga, 1949; Kapp,

2012; McGonigal, 2011). Noemí & Máximo (2014) defined games as a physical or mental competition played based on certain rules for entertainment or awards by the participants. Domínguez et al. (2013), on the other hand, described games as the process of conducting several complex tasks based on certain rules. McGonigal (2011) reported that games are powerful structures that provide solutions for human desires, needs, and daily life problems, and also have positive effects on participation and motivation, while Kapp (2012) described games as conflict-based constructs where emotional reactions and learning outcomes could be observed.

Kuzu and Çankaya (2010) reported that games motivate since they are a participatory activity that creates individual pleasure and satisfaction and they make people want to play again and again, Prensky (2001) argued that individuals learn through games and fun; therefore, games that are inherently motivating should be employed for voluntary participation and motivation of students in learning activities. Prensky (2001) described the contemporary individuals as "Game Generation". Thus, the idea of the employment of games in learning environments that are designed for the game generation has led to the concept of educational games. Educational games has been described with several definitions. These included planned and purposive games (Coşkun, Akarsu, & Kariper, 2012) that aim learning achievements, reinforcement of learning, and to develop an environment for the improvement of knowledge and skills, an instructional strategy that includes competition and well-organized rules and restrictions to achieve certain educational goals (Dempsey, Lucassen, Haynes, & Casey, 1996), and the employment of game technologies to achieve desired outcomes in learning and instruction processes (Ibrahim & Jaafar, 2011). Although educational games are considered entertainment, the main aim of these games is education (Noemí & Máximo, 2014). Sawyer (2002) reported that educational games are simulations employed to solve real world problems. Due to the advances in information and communication technologies, games became real and reality became gamified (Volkova, 2013).

Various factors play a role in the success of educational games. These include the design of the educational games based on individual preferences, needs, goals and skills, the ability of the educational game to provide learning and playful experiences, and the capacity to maintain the motivation and interest of the individual (Kickmeier-Rust, Mattheiss, Steiner, & Albert, 2011). Najdi & Sheikh (2012) reported that well-planned educational games would play an important role in the development of positive learning attitudes and provide the maximum benefit in learning processes when designed based on the personal traits of the student. In that study, they concluded that educational games improved positive attitude towards learning and reduced the student stress when compared to traditional learning environments. The literature review revealed that educational games had a positive effect on student attitudes towards courses (Ke, 2008; Shin, Sutherland, Norris, & Soloway, 2012). Abt (1987) stated that educational games were an effective educational and instructional tool since they increase student motivation and allow the acquisition of various topics by students of all ages. Braghirolli, Ribeiro, Weise, & Pizzolato (2016) reported that educational games increased student motivation and student participation and interest in the course. Several studies in the literature demonstrated that educational games increased motivation (Burguillo, 2010; Dickey, 2011; Wang & Chen, 2012, Zeng, Parks & Shang, 2020). Lee and Hao (2015) reported that active use of educational games facilitated student participation and the acquisition of abstract concepts. Furthermore, studies in the literature reported that educational games improved student achievements (Chen & Chiu, 2016; Kebritchi, Hirumi, & Bai, 2010, Talan, Doğan & Batdı,

2020). Ibrahim, Wahab, Che Mod Yusof, Khalil, and Jaafar (2011) argued that due to the fun factor in educational games, students believed that they learned better. Educational games also play important role in the improvement of learning performance and mental capacity of the students (Chen & Chiu, 2016; Najdi & Sheikh, 2012; Wang & Chen, 2012, Vu & Feinstein, 2017). It was reported that educational games had positive effects on the learner when compared to traditional learning environments. In a literature review, Samur and Evans (2012) found that educational games lead to more effective results in all learning environments when compared to traditional learning methods. Similarly, in a study conducted by Cop and Zeynel (2018), it was concluded that educational games had a positive effect on achievement, achievement level, learning level, attitudes, and permanence, and educational games led to a significant difference.

Educational games have been classified with different approaches by various authors. Petri and von Wangenheim (2016) classified educational games into two groups of digital educational games and non-digital educational games based on the employed platform. Digital educational games were classified as educational computer games, educational console games and mobile educational games, while non-digital games were classified as board games, card games, paper and pencil games and object games. Further classifications included computer games based on information and communication technologies, object games played with certain toys, perception games that allow active functioning of multiple sensory organs (Aytaş & Uysal, 2017), educational computer games, educational card and cardboard games, educational games that include 3-dimensional materials, educational mobile games and educational games that include physical movements (Cop & Zeynel, 2018), and entertainment and learning games (Braghirolli et al., 2016). Connolly, Boyle, MacArthur, Hainey, and Boyle (2012) reported that games used for educational purposes were serious games. Sezgin (2018) classified educational games as traditional digital games, virtual reality games and augmented reality games based on the employed digital technology. Although the classifications of educational games lack a holistic approach, educational games could be classified as information and communication technology games and educational games that do not require information and communication technologies. Literature review revealed the use of various terms associated with educational games apart from the above-mentioned classifications. These included game-based learning, serious games, digital learning games, persuasive games, instructional games, epistemic games and educational entertainment games (Braghirolli et al., 2016). Braghirolli et al. (2016) reported that although there were nuances between the use of these terms in various studies on educational games, they all contributed to the understanding of educational games.

Several meta-analyses were conducted in the literature on educational games. Petri and von Wangenheim (2017) investigated 112 studies on the use of educational games in computer education and reported a need to provide game designers and educators with strong analysis and methodological support in educational game design and instructional stages. Cop and Zeynel (2018) discussed the methodological approaches and educational game types in 96 studies published in Turkey. In a study on the effects of computer games and serious games on learning, participation and skill development, Connolly, Boyle, MacArthur, Hainey, and Boyle (2012) concluded that entertainment was the primary goal in most games, digital games were dominant, and simulations were the most played game type. They also stated that the positive effects and outcomes of digital games were also important. Boyle et al. (2016) updated a previous study conducted by Connolly et al. (2012). In

the study, 512 research conducted between 2012 and 2014 were identified, and 143 high quality studies were analyzed. It was determined that interest in the positive effects of digital games increased, entertainment was the primary purpose in most games, digital games were dominant, and the most played type of game was simulations in studies conducted during the previous 5 years. Calderón and Ruiz (2015) investigated 102 studies on serious games employed in software project management and determined that most studies were conducted in higher education level, aimed to determine the educational effects of serious games, and found that the most employed type of game was computer games. In another study, Qian and Clark (2016) reviewed the studies conducted on the effects of game-based learning on 21st century skills and reported that game-based learning had a positive impact on the development of 21st century skills. Hainey, Connolly, Boyle, Wilson, and Razak (2016) reported that the games were played for entertainment in 14 studies, for learning purposes in 91 studies, for game-based learning at primary school level in 105 studies between 2000 and 2013, and the leading types of games were strategy games and puzzles.

Previous literature reviews demonstrated that the studies on educational games were not comprehensive and limited to a particular field or a certain time interval. Thus, the present study aimed to investigate the studies on educational games with a holistic approach without field, temporal or genre limitations. For this purpose, the following research problems were determined:

1. What is the distribution of studies on educational games based on the year, publication type, country of publication, audience, topics, and the terms used in the study title?
2. What is the distribution of studies on instructional methods based on the year, publication type, country of publication, audience, topics, and the terms used in the study title?
3. What is the distribution of studies on learning activities based on the year, publication type, country of publication, audience, topics, and the terms used in the study title?
4. What is the distribution of studies on simulations based on the year, publication type, country of publication, audience, topics, and the terms used in the study title?
5. What is the distribution of studies on classroom activities based on the year, publication type, country of publication, audience, topics, and the terms used in the study title?

Method

Descriptive analysis method was employed to determine the general trends in studies on educational games. Initially, the data were collected and prepared for analysis. Then, the data were analyzed progressively.

Data Collection

The following steps were employed in the collection of the study data:

1. Database access: The study data were collected with the ERIC (Education Resources Information Center) database.
2. Database search: The studies on educational games published between 01.01.1965 and 01.01.2019 were searched in the ERIC database with the “educational games” keyword. The search produced 7141 studies

on educational games.

3. Data organization: The data included in the study abstracts were employed in the analysis. The abstract data were classified with software developed by the authors with Python and prepared for analysis.

Data Analysis

The study data were analyzed in two stages. The data analysis structure is presented in Figure 1.

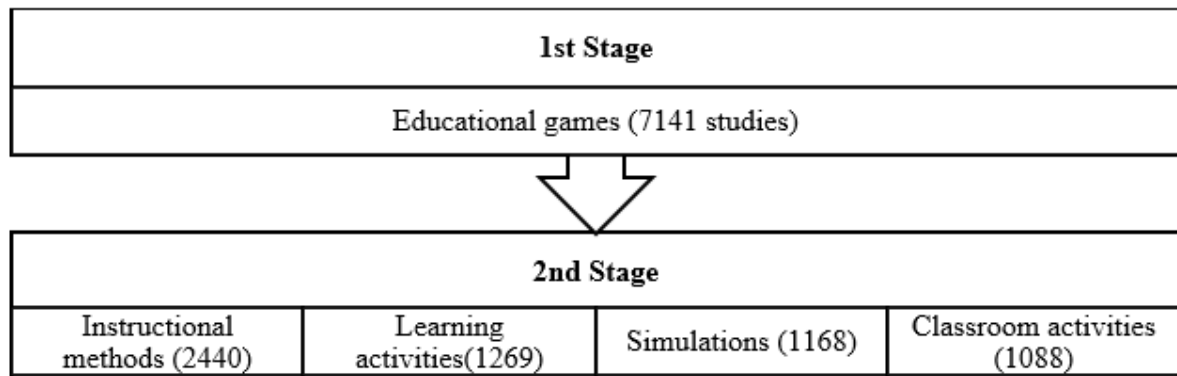


Figure 1. Data Analysis Stages

As seen in Figure 1, 7141 studies on educational games were analyzed in the 1st stage based on the year of publication, the publication type, the country of publication, the audience, the topic, and the terms employed in the study title with a holistic approach. In the second stage, the instructional methods, learning activities, simulations and classroom activities, which were determined in the first stage, were analyzed separately based on the year of publication, the publication type, the country of publication, the audience, the topic, and the terms employed in the study title.

Findings

The study data obtained were analyzed in two stages. In the first stage, the findings reported by all studies on educational games are presented. In the second stage, the most common topics investigated in studies on educational games were analyzed and presented separately.

Findings on Studies Conducted on Educational Games

The Distribution of Research based on the Year of Publication

The number of accessed studies on educational games published between 1965 and 2019 was 7141. The distribution of these studies based on the year of publication is presented in Figure 2.

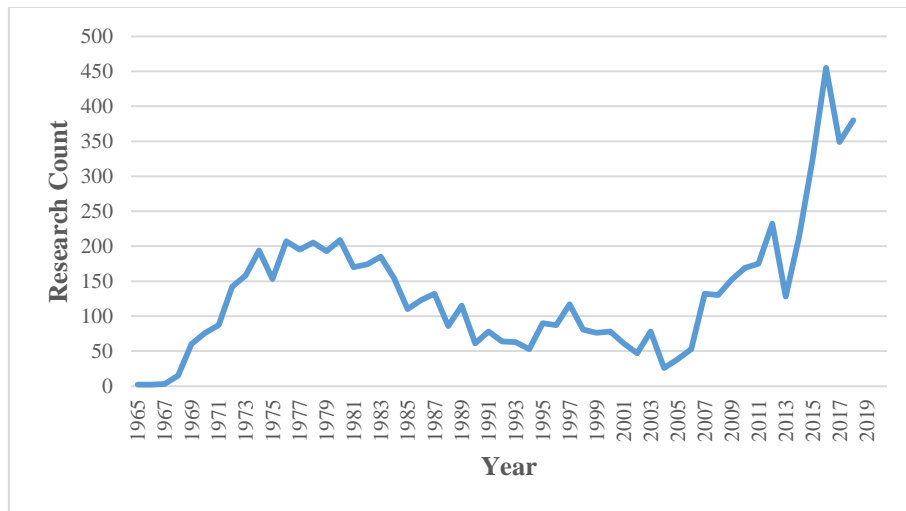


Figure 2. The Distribution of Studies based on the Year of Publication

As seen in Figure 2, the first two studies on educational games were conducted in 1965. Although the number of studies on educational games increased between 1965 and 1976 and between 2007 and 2016, there were fluctuations in other years. The year with the highest number of studies was 2016 (455).

The Distribution of Research based on Publication Type

There were 11341 publications in 34 publication types. The 10 most preferred publication types are presented in Figure 3. As seen in Figure 3, the preferred publication type was journal articles with 4183 research.

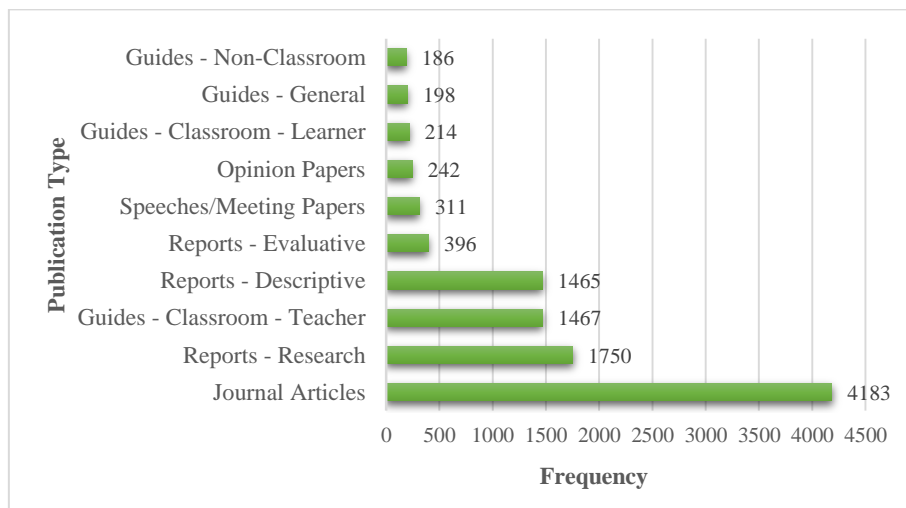


Figure 3. The Distribution of Research based on Publication Type

The Distribution of Research based on the Country of Publication

It was determined that 1945 studies were published in 233 countries. The countries with 40 or higher publications are presented in Figure 4.

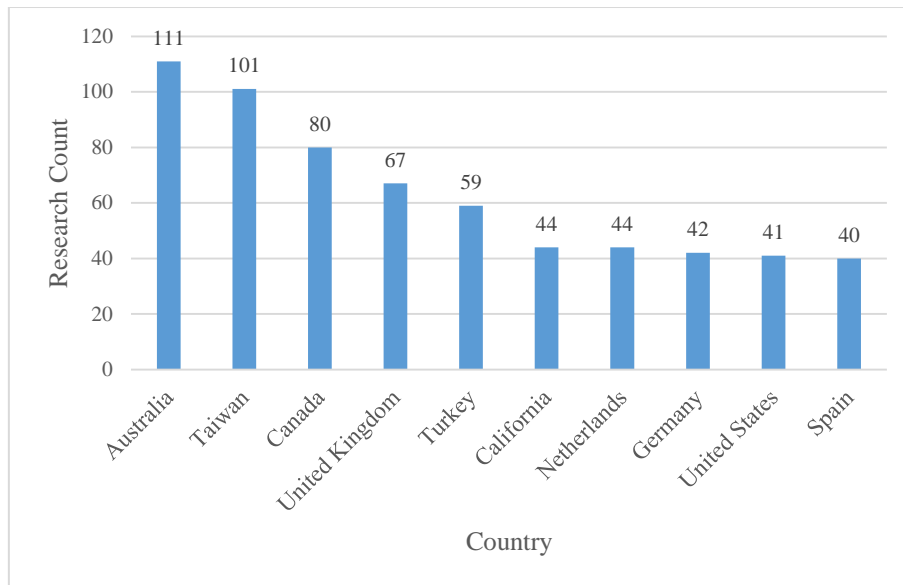


Figure 4. The Distribution of Research based on the Country of Publication

In Figure 4, it could be observed that the countries with the highest number of publications were Australia (111), Taiwan (101), Canada (80) United Kingdom (67), Turkey (59), California (44), the Netherlands (44), Germany (42) , USA (41) and Spain (40).

The Distribution of Research based on the Audience

The number of different audiences mentioned in the studies was 2858 in 11 groups. The audiences and frequencies of these types are presented in Figure 5.

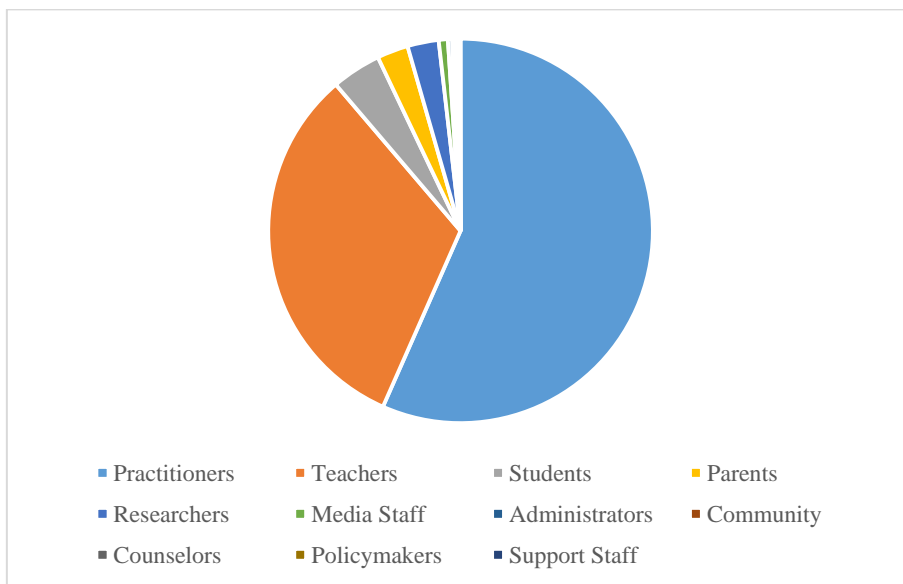


Figure 5. The Distribution of Research based on the Audience

As seen in Figure 5, the most frequent audience was the practitioners (1618) in studies. They were followed by teachers (919), students (119), parents (75), researchers (75), media employees (22), administrators (10),

communities (9), consultants (6), policy makers (4) and support staff (1), respectively. These findings demonstrated that most of the studies on educational games were conducted to reach practitioners and teachers. The audience information was available in studies conducted since 1980. The first four common target groups in studies conducted between 1980 and 2019 are presented in Table 1.

Table 1. The Changes Observed in the Audience between 1965 and 2019

Period	1.	2.	3.	4.
1980-1989	Practitioners (835)	Teachers (315)	Students (45)	Researchers (41)
1990-1999	Practitioners (345)	Teachers (330)	Students (52)	Parents (25)
2000-2009	Teachers (138)	Practitioners (70)	Students (12)	Parents (89)
2010-2019	Teachers (136)	Practitioners (11)	Researchers (10)	Students (10)

The review of Table 1 would demonstrate that the majority of the studies conducted between 1980 and 1989 aimed practitioners and teachers. Between 1990 and 1999, it was observed that numerous studies were conducted for practitioners, but a decrease was observed in the number of these studies. Furthermore, it was observed that there was an increasing trend in studies where the parents were the target audience. Studies that aimed to reach teachers were the most frequent between 2000 and 2009. In studies on educational games, the audience trend shifted from practitioners to teachers. In studies conducted between 2010 and 2019, teachers were the most frequent target audience.

The Topical Distribution of the Research

The keywords section of the studies included 80379 topics in 3892 different groups. The prominent study topics between 1965 and 2019 are presented in Figure 6.



Figure 6. Prominent Study Topics

As seen in Figure 6, studies on educational games were conducted on various topics. The changes in research topics over the years are presented in Table 2.

Table 2. Prominent Study Topics based on Period

Period	1.	2.	3.	4.
1965-1969	Instructional Methods (30)	Simulation (26)	Class Activities (22)	Instructional Material (13)
1970-1979	Class Activities (597)	Instructional Methods (561)	Simulation (513)	Instructional Material (367)
1980-1989	Learning Activities (484)	Instructional Methods (387)	Elementary Education (348)	Simulation (299)
1990-1999	Learning Activities (220)	Instructional Methods (196)	Elementary Education (173)	Elementary Secondary Education (166)
2000-2009	Instructional Methods (286)	Mathematics Instruction (138)	Educational Technology (114)	Computer Use in Education (92)
2010-2019	Instructional Methods (980)	Educational Technology (784)	Computer Games (491)	Technology Use in Education (460)

As seen in Table 2, although instructional method was the prominent research topic between 1965 and 1969, classroom activities was prominent between 1970 and 1979. It was determined that learning activities was the most frequent topic between 1980 and 1989, and between 1990 and 1999 and instructional methods was the most frequent between 2000 and 2009, and between 2010 and 2019. Between 2000 and 2009, educational technologies and computer use in education were among the most prominent 4 topics. Between 2010 and 2019, the prominence of educational technologies, computer games, and technology use in education increased.

The Terms used in Study Titles

In study titles, 50 terms were used 6691 times. The most common terms are presented in Figure 7.

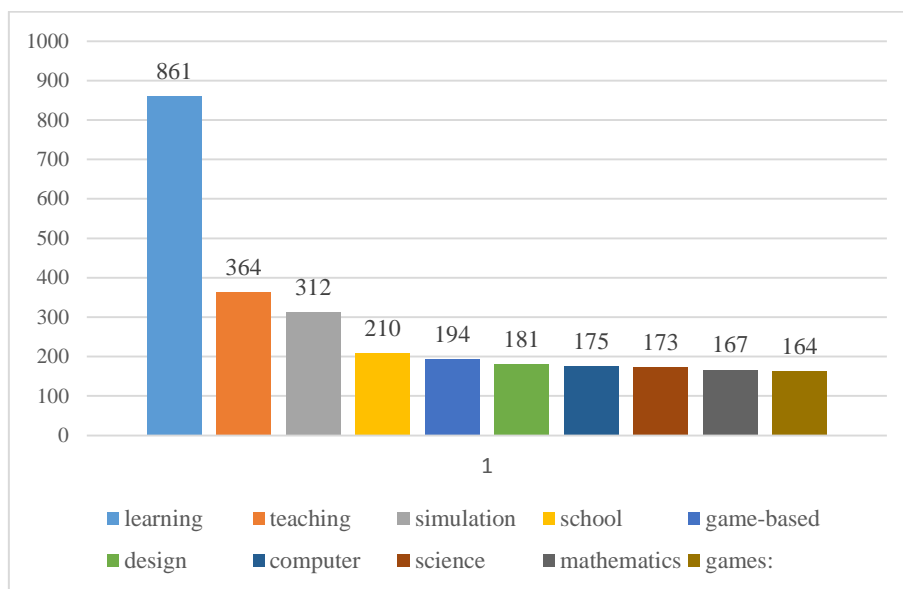


Figure 7. The Distribution of the Studies based on the Terms used in Titles

As seen in Figure 7, the most frequent term was learning (861) in study titles. This term was followed by teaching (364), simulation (312), school (21), game-based (194), design (181), computer (175), science (173), mathematics (167), and games (164), respectively.

Instruction Methods

The Distribution of Research based on the Year of Publication

The analysis of the research topics revealed that the topic with the highest frequency was instruction methods. Instruction methods were the topic in 2440 studies conducted between 1965 and 2019. The distribution of the studies based on the year of publication is presented in Figure 8.



Figure 8. The Distribution of Research on Instruction Methods based on the Year of Publication

As seen in Figure 8, the first study on instruction methods was conducted in 1965. The highest number of studies on instruction methods was conducted in 2016 (179).

The Distribution of Research based on the Publication Type

There were 3951 publications in 30 groups on instruction methods. Journal articles (1536) was the most frequent publication type. They were followed by research reports (643), descriptive reports (569), classroom-teacher guides (443), and analysis reports (147), respectively. Holistic analysis of the studies on educational games demonstrated that journal articles were also the prominent publication type. Thus, the studies on instruction methods were consistent with this finding.

The Distribution of Research based on the Country of Publication

Among the analyzed studies, 767 were conducted in 164 countries. The countries with the highest number of publications were Taiwan (47), Australia (46), Turkey (26) and the United Kingdom (25). Australia, which ranked first in studies on educational games, was not the nation with the highest number of publications on

instruction methods. This finding was not consistent with the overall findings. Taiwan, Turkey and the United Kingdom were among the countries with the highest number of studies on instruction methods, similar to the research on educational games. This finding was consistent with the overall study findings.

The Distribution of Research based on the Audience

In 827 studies on instruction methods, the target audience was specified. These included practitioners (457), teachers (311), researchers (34), students (12), parents (5), administrators (3) and communities (29). It was observed that the studies prioritized practitioners and teachers. In studies on teaching methods, practitioners and teachers were the most frequently targeted groups, similar to the studies on educational games. Thus, the studies on instruction methods were consistent with those on educational games based on the target audience.

The Terms used in Study Titles

The review of the titles of the studies on instruction methods revealed 2456 terms in 50 categories. Learning was the most mentioned term in study titles (312). It was followed by teaching (187), simulation (106) and game-based (76) terms, respectively.

Learning Activities

The Distribution of Research based on the Year of Publication

The analysis of study topics revealed that the second most frequent topic was learning activities. Learning activities were the topic in 1269 studies conducted between 1965 and 2019. The distribution of these studies by the year of publication is presented in Figure 9.

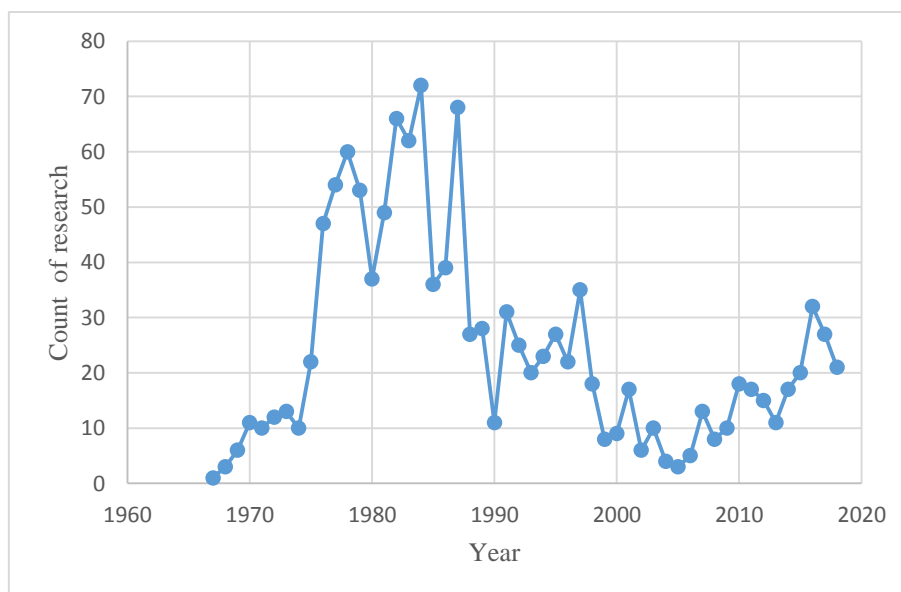


Figure 9. The Distribution of Research on Learning Activities based on the Year of Publication

As seen in Figure 9, the first research on learning activities was conducted in 1967. The highest number of studies on learning activities was conducted in 1984 (72).

The Distribution of Research based on the Publication Type

The studies on learning activities included 1951 publications in 32 publication types. Classroom-teacher guides (575) were the highest type of publication. They were followed by journal articles (565), descriptive reports (192), research reports (111), and classroom-learner guides (102). The comparison of the studies on educational games with this finding revealed that, while journal articles were the most frequent publication type overall, classroom-teacher guides were the most prevalent in studies on learning activities.

The Distribution of Research based on the Country of Publication

In 211 studies, 92 studies reported the country of publication information. The countries with the highest number of publications on learning activities were Australia (10), Canada (9) and Taiwan (8). Australia, which ranked first in publications on educational games, was not among the countries with the highest number of research on learning activities. This finding was consistent with the overall study findings. Taiwan was among the countries with highest number of studies on learning activities similar to the educational games.

The Distribution of Research based on the Audience

The target audience was specified in 1055 studies on learning activities. The target audiences included practitioners (557), teachers (366), students (55), parents (50), multimedia workers (10) and researchers (8). It was seen that the studies that reported a target audience mostly targeted practitioners and teachers. In studies on learning activities, practitioners and teachers were most frequently stated as the target audience, similar to the studies on educational games. Thus, the target audiences of both types of studies were consistent.

The Terms used in Study Titles

The analysis of the titles of the studies on learning activities revealed 1258 concepts in 50 categories. Learning was the most frequently mentioned term in study titles (122). It was followed by activities (81), instruction (77) and books (55), respectively.

Simulations

The Distribution of Research based on the Year of Publication

Among the study topics, the third most frequent topic was the simulations. Simulations were the topic in 1168 studies conducted between 1965 and 2019. The distribution of these studies based on the year of publication is presented in Figure 10.

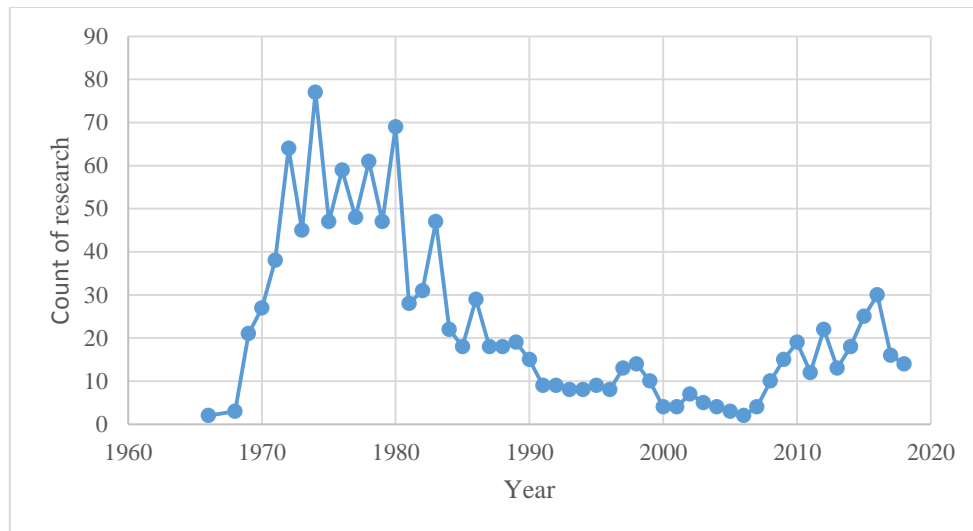


Figure 10. The Distribution of Research on Simulations based on the Year of Publication

As seen in Figure 10, the first research on simulations was conducted in 1965. The highest number of research on simulations was conducted in 1974 (77).

The Distribution of Research based on the Publication Type

The studies on simulations included 1441 publication types in 29 categories. Journal articles (489) were the most common publication type. They were followed by descriptive reports (211), research reports (158), classroom-teacher guides (149), and opinion essays (71). The overall review of the studies on educational games showed that journal articles were the most common publication type as well. They were also the most common type of publication in studies on simulations. Thus, the study data were consistent.

The Distribution of Research based on the Country of Publication

Among 219 studies, 95 mentioned the country of publication. The highest number of studies on simulations was published in Australia (13), Canada (12) and the United Kingdom (10). Australia, which ranked first in research on educational games, was also the leading country in simulation research. This finding was consistent with the overall findings.

The Distribution of Research based on the Audience

Among the studies on simulations, 453 specified a target audience. These included practitioners (305), teachers (99), researchers (26), students (13), administrators (4), and communities (3). It was observed that most studies targeted practitioners and teachers. In studies on simulations, practitioners and teachers were the primary target audience, similar to overall studies on educational games. Thus, simulation research target audience was consistent with that of the educational game studies.

The Terms used in Study Titles

The analysis of the titles of the studies on simulations revealed 48 terms were used 1266 times. Simulation (315) was the most common term mentioned in study titles. It was followed by learning (76), instruction (69) and social (59), respectively.

Classroom Activities

The Distribution of Research based on the Year of Publication

The fourth topic most frequent topic was classroom activities. Classroom activities were the topic in 1088 studies conducted between 1965 and 2019. The distribution of the studies by the year of publication is presented in Figure 11. As seen in Figure 11, the first study on classroom activities was conducted in 1965. The highest number of studies on classroom activities was conducted in 1977 (88).

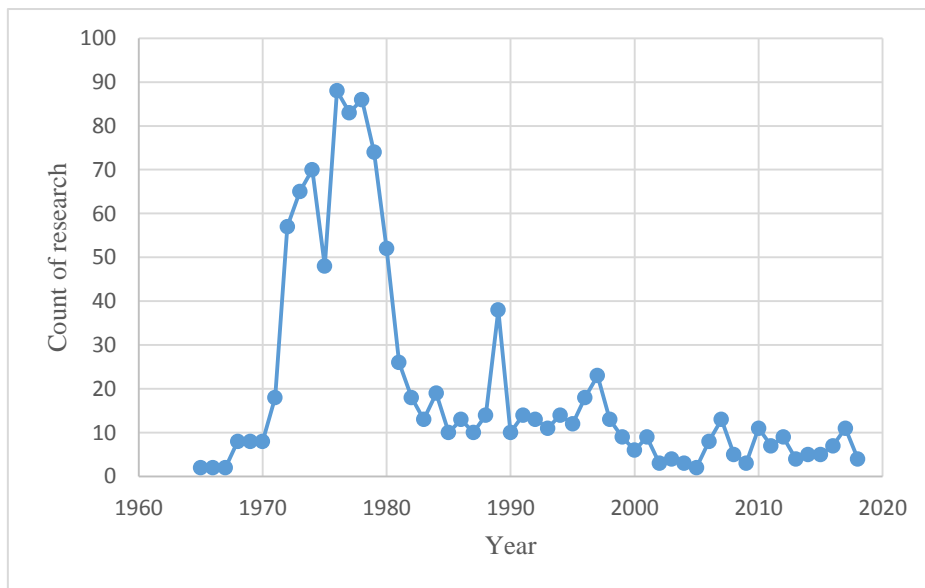


Figure 11. The Distribution of Research on Classroom Activities based on the Year of Publication

The Distribution of Research based on the Publication Type

In studies on classroom activities, 1161 publications specified 24 publication types. The majority of the publications were journal articles (354). These were followed by classroom-teacher guides (317), descriptive reports (135), general guides (79), and proceedings (54). It was previously determined that the majority of the studies on educational games were journal articles. Thus, both findings were consistent.

The Distribution of Research based on the Country of Publication

In 96 studies, 53 countries were specified. The highest numbers of studies on classroom activities were conducted in the USA (9), Canada (7), United Kingdom (6), and Israel (5). Australia ranked first in studies on

educational games, while the United States ranked first in studies on classroom activities. These findings were consistent.

The Distribution of Research based on the Audience

The target audience was indicated in 554 studies on classroom activities. These included practitioners (368), teachers (161), students (17), parents (5), communities (1), multimedia workers (1), and researchers (1). It was observed that the studies which declared a target audience mostly targeted practitioners and teachers. In studies on classroom activities, similar to the studies on educational games, practitioners and teachers were the most frequent target audience. Thus, the audience findings for the studies on classroom activities and studies on educational games were consistent.

The Terms used in Study Titles

The analysis of the titles of the studies on classroom activities demonstrated that 50 terms were used 869 times. The term activities (358) was the most frequently used term in study titles. It was followed by instruction (56), classroom (50) and simulation (45) terms, respectively.

Discussion

In the present study, 7141 studies on educational games were analyzed. Although the number of studies increased between 1965 and 1976, and between 2007 and 2016, it was determined that the highest number of studies was conducted in 2016. The most researched topics included instruction methods, learning activities, simulations and classroom activities, and the initial studies on these topics were conducted between 1965 and 1967. The most frequent research topics based on the year of publication were instruction methods in 2016, learning activities in 1984, simulations in 1966 and classroom activities in 1977. Furthermore, it was determined that different topics were addressed more frequently in certain periods. These included instruction methods, simulations, instruction material, classroom activities, primary school education, secondary school education between 1965 and 1999, and instruction methods, mathematics instruction, educational technologies, computer use in education, computer games and technology use in education between 2000 and 2019. The advances in information and communication technologies and popularization of the internet were reflected in studies on educational games published since 2000. It was determined that topics such as educational technologies, computer use in education, computer games, and technology use in education dominated the studies on educational games after 2000. Thus, it could be suggested that the educational games platforms became digital. Previous study findings were consistent with the present study results. Connolly et al. (2012) reported in a meta-review that most studies on serious games conducted between 2004 and 2009 addressed digital educational games. Boyle et al. (2016) also determined that digital educational games were predominant between 2012 and 2014. Calderón and Ruiz (2015), Hainey et al. (2016) and Cop and Kablan (2018) reported that educational computer games were the most employed educational games.

It was determined that journal articles were the most frequent publication type. These were followed by researcher reports, classroom-teacher guides, and descriptive reports. Among studies on learning methods, simulations and classroom activities, journal articles were also the most common publication type, and classroom-teacher guides were the most frequent publication type in studies on learning activities. Although the type of publication findings associated with the instruction methods, simulations and classroom activities studies were consistent with the educational game study findings, it was determined that the same consistency was not observed with the learning activities topic.

It was determined that the highest numbers of studies on educational games were published in Australia, Taiwan and Canada, respectively. The countries where the highest number of studies on instruction methods were published included Taiwan, Australia, and Turkey. The countries where the highest number of studies on learning activities were published included Australia, Canada, and Taiwan. The countries where the highest number of studies on simulations were published included Australia, Canada and the UK. . The countries where the highest number of studies on classroom activities were published included the USA, Canada and the United Kingdom.

Target audience information was first mentioned in research on educational games conducted in 1980. Practitioners were the most prominent audience in studies. They were followed by teachers, students, researchers, and parents, respectively. It was determined that studies that targeted practitioners were prominent between 1980 and 1999, and teachers became more prominent between 2000 and 2019, in particular between 2010 and 2019. It was determined that there was a continuous increase in studies that targeted parents between 1990 and 2009; however, the popularity started to decrease between 2010 and 2019. It was observed that studies that targeted students were prominent between 1980 and 1999. In studies on instruction methods, learning activities, simulations and classroom activities, it was determined that practitioners and teachers were the target audience. In a study on educational games, Cop and Kablan (2018) determined that the studies mostly targeted students and teachers.

The most frequently employed concepts in the titles of studies on educational games were learning, teaching, simulation, school, game-based, design, computer, science, mathematics and games, respectively. Since the main aim of educational games is the acquisition of predetermined achievements by the individual, it could be expected that the terms learning, and teaching would be the most common terms in study titles. The most common concept in the titles of the studies on instruction methods and learning activities was learning. The concept of simulation was the most common concept in the titles of studies on simulations, and the concept of activity was the most common concept in the titles of studies on classroom activities.

Conclusion

In the present study where the studies on educational games published between 1965 and 2019 were reviewed, it was determined that the highest number of studies was conducted in 2016 and the most common topics in these studies included instruction methods, learning activities, simulations and classroom activities. Especially since

2000, it was concluded that the majority of the studies were conducted on educational games. Advances in technology led to changes in the media employed to play educational games. It was observed that journal articles were the most common publication type, and the highest numbers of studies were published in Australia, Taiwan and Canada. It was concluded that practitioners were the prominent target audience in studies until 1999, and teachers were the most common target audience after 2000. The most frequently used concepts in study titles included learning, teaching, simulation, school, game-based, design, computer, science, mathematics and games, respectively. It could be suggested that the fact that the concepts of learning and teacher were common in study titles indicated that these concepts were consistent with the intended purpose of the educational games.

References


- Abt, C. C. (1987). *Serious games*. University press of America.
- Aytaş, G., & Uysal, B. (2017). A Review on Play Term and Its Classification Abstract. *Celal Bayar University Journal of Social Sciences*, 1–1. <https://doi.org/10.18026/cbayarsos.298146>
- Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J., Ott, M., Pereira, J. (2016). An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers and Education*, 94, 178–192. <https://doi.org/10.1016/j.compedu.2015.11.003>
- Braghirolli, L. F., Ribeiro, J. L. D., Weise, A. D., & Pizzolato, M. (2016). Benefits of educational games as an introductory activity in industrial engineering education. *Computers in Human Behavior*, 58, 315–324.
- Burguillo, J. C. (2010). Using game theory and Competition-based Learning to stimulate student motivation and performance. *Computers and Education*, 55(2), 566–575. <https://doi.org/10.1016/j.compedu.2010.02.018>
- Calderón, A., & Ruiz, M. (2015). A systematic literature review on serious games evaluation: An application to software project management. *Computers and Education*, 87, 396–422. <https://doi.org/10.1016/j.compedu.2015.07.011>
- Chen, C. H., & Chiu, C. H. (2016). Employing intergroup competition in multitouch design-based learning to foster student engagement, learning achievement, and creativity. *Computers and Education*, 103, 99–113. <https://doi.org/10.1016/j.compedu.2016.09.007>
- Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers and Education*, 59(2), 661–686. <https://doi.org/10.1016/j.compedu.2012.03.004>
- Cop, R. M., & Kablan, Z. (2018). The Analysis of Studies on Educational Games in Turkey. *Kocaeli University Journal of Education*, 1, 52–71.
- Coşkun, H., Akarsu, B., & Kariper, İ. A. (2012). The Effects of Educational Games based on Science Stories on Students' Academic Achievements in Science and Technology Classroom. *Journal of Kırşehir Education Faculty*, 13(1), 93–109.
- Dempsey, J. V., Lucassen, B. A., Haynes, L. L., & Casey, M. S. (1996). Instructional applications of computer games. *Annual Meeting of the American Educational Research Association (AERA)*.
- Dickey, M. D. (2011). Murder on Grimm Isle: The impact of game narrative design in an educational game-based learning environment. *British Journal of Educational Technology*, 42(3), 456–469.

- Domínguez, A., Saenz-De-Navarrete, J., De-Marcos, L., Fernández-Sanz, L., Pagés, C., & Martínez-Herráiz, J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers and Education*, 63, 380–392. <https://doi.org/10.1016/j.compedu.2012.12.020>
- Fox, D., & Verhovsek, R. (2002). Micro Java game development. In Addison-Wesley Professional. Retrieved from: https://books.google.com.tr/books?id=tCxvX60J8OAC&printsec=frontcover&hl=tr&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
- Hainey, T., Connolly, T. M., Boyle, E. A., Wilson, A., & Razak, A. (2016). A systematic literature review of games-based learning empirical evidence in primary education. *Computers and Education*, 102(February 2009), 202–223. <https://doi.org/10.1016/j.compedu.2016.09.001>
- Huizinga, J. (1949). *Homo Ludens: A study of the play element in culture* (2nd ed.). Retrieved from http://art.yale.edu/file_columns/0000/1474/homo_ludens_johan_huizinga_routledge_1949_.pdf
- Ibrahim, R., & Jaafar, A. (2011). User acceptance of educational games: A revised unified theory of acceptance and use of technology (UTAUT). *World Academy of Science, Engineering and Technology*, 77(5), 551–557.
- Ibrahim, R., Wahab, S., Che Mod Yusof, R., Khalil, K., & Jaafar, A. (2011). Student perceptions of educational games in higher education: An empirical study. *Issues in Information Systems*, 12(1), 120–133.
- Kapp, K. M. (2012). *The gamification of learning and instruction: game-based methods and strategies for training and education*. John Wiley & Sons.
- Ke, F. (2008). Computer games application within alternative classroom goal structures: cognitive, metacognitive, and affective evaluation. *Educational Technology Research and Development*, 56(5), 539–556. <https://doi.org/10.1007/s11423-008-9086-5>
- Kebritchi, M., Hirumi, A., & Bai, H. (2010). The effects of modern mathematics computer games on mathematics achievement and class motivation. *Computers and Education*, 55(2), 427–443. <https://doi.org/10.1016/j.compedu.2010.02.007>
- Kickmeier-Rust, M. D., Mattheiss, E., Steiner, C., & Albert, D. (2011). A psycho-pedagogical framework for multi-adaptive educational games. *International Journal of Game-Based Learning (IJGBL)*, 1(1), 45-58.
- Kuzu, A., & Çankaya, S. (2010). *Transformations in the game*. In F. Odabaşı (Ed.). *Transformations In The Light of Information and Communication Technologies*. Nobel Publishing.
- Lee, L. C., & Hao, K. C. (2015). Designing and evaluating digital game-based learning with the ARCS motivation model, humor, and animation. *International Journal of Technology and Human Interaction (IJTHI)*, 11(2), 80-95. <https://doi.org/10.4018/ijthi.2015040105>
- McGonigal, J. (2011). *Reality Is Broken* (1st ed.). Newyork: The Penguin Press.
- Najdi, S., & Sheikh, R. El. (2012). Educational Games: Do They Make a Difference?. *Procedia - Social and Behavioral Sciences*, 47, 48–51. <https://doi.org/10.1016/j.sbspro.2012.06.612>
- Noemí, P.-M., & Máximo, S. H. (2014). Educational games for learning. *Universal Journal of Educational Research*, 2(3), 230–238. <https://doi.org/10.13189/ujer.2014.020305>
- Petri, G., & Gresse von Wangenheim, C. (2017). How games for computing education are evaluated? A systematic literature review. *Computers and Education*, 107, 68–90.
- Petri, G., & von Wangenheim, C. G. (2016). How to evaluate educational games: A systematic literature review. *Journal of Universal Computer Science*, 22(7), 992–1021.

- Piccione, P. A. (1980). In Search of the Meaning of Senet. *Archaeology*, 33(33), 55–58.
- Prensky, M. (2001). The Digital Game-Based Learning Revolution. Retrieved from <http://www.marcprensky.com/writing/Prensky - Ch1-Digital Game-Based Learning.pdf>
- Qian, M., & Clark, K. R. (2016). Game-based Learning and 21st century skills: A review of recent research. *Computers in Human Behavior*, 63, 50–58. <https://doi.org/10.1016/j.chb.2016.05.023>
- Samur, Y., & Evans, M. A. (2012). The effects of serious games on performance and engagement: A review of the literature (2001-2011). *American Education Research Association Conference*. Vancouver, BC, Canada.
- Sawyer, B. (2002). Improving public policy through game-based learning and simulation, foresight and governance project. *Woodrow Wilson International Center for Scholars*, Digitalmill, Inc, 2002.
- Sezgin, S. (2018). Analysing Adaptive Gamification Design Principles for Online Courses. Doctoral dissertation. Retrieved from <https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp>
- Shin, N., Sutherland, L. M., Norris, C. A., & Soloway, E. (2012). Effects of game technology on elementary student learning in mathematics. *British journal of educational technology*, 43(4), 540-560.
- Volkova, I. I. (2013). Four pillars of gamification. *Middle-East Journal of Scientific Research*, 13, 149-152. <https://doi.org/10.5829/idosi.mejsr.2013.13.sesh.1427>
- Vu, P. & Feinstein, S. (2017). An exploratory multiple case study about using game-based learning in STEM classrooms. *International Journal of Research in Education and Science (IJRES)*, 3(2), 582-588. DOI: 10.21890/ijres.328087
- Wang, L. C., & Chen, M. P. (2012). Effects of the sequence of game-play and game-design on novices' motivation, flow, and performance. In *Transactions on Edutainment VIII* (pp. 46-55). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-31439-1_5
- Talan, T., Doğan, Y., & Batdı, V. (2020). Efficiency of digital and non-digital educational games: A comparative meta-analysis and a meta-thematic analysis. *Journal of Research on Technology in Education*, 52(4), 474-514.
- Yılmaz, E. A. (2015). Gamification (1st ed.). Abaküs Publishing
- Zeng, J., Parks, S., & Shang, J. (2020). To learn scientifically, effectively, and enjoyably: A review of educational games. *Human Behavior and Emerging Technologies*, 2(2), 186-195.

Author Information

Hüseyin Yaşar

 <https://orcid.org/0000-0003-1176-1916>


Sakarya University

Institute of Education Sciences

Turkey

Contact e-mail: hsyasar@gmail.com

Mübin Kıyıcı

 <https://orcid.org/0000-0001-9458-7831>

Sakarya University

Department of Computer and Instructional

Technologies

Turkey
