Game-Based Learning Studies in Education Journals: A Systematic Review of Recent Trends

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Abstract: This study investigates descriptively the use of game-based applications in learning and teaching environments. Each empirical finding was categorized according to paper title, year of publication, number of citations in the Web of Science (WoS) database in SCI, SSCI and AHCI, learning theory, learning principle, game genre, game design elements, learning outcomes and research skills samples, and learning domains. A total of 190 original game-related research articles were selected as sources in six peer-reviewed journals with a 12-year period from 2005 to 2017. The research found that game studies, as well as the cognitive understanding and application-level knowledge of the field are more effective in learning and in student achievements in terms of retention.

Keywords: agame-based education, research trends, citation analysis, journals, review.

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Estudios sobre aprendizaje basado en juegos en revistas educativas: una revisión sistemática de tendencias recientes

Resumen: Este estudio investiga descriptivamente el uso de aplicaciones basadas en juegos en entornos de aprendizaje y enseñanza. Cada resultado empírico fue categorizado según el título del artículo, año de publicación, número de citas en la base de datos Web of Science (WoS) en SCI, SSCI y AHCI, teoría del aprendizaje, principio de aprendizaje, género del juego, elementos de diseño del juego, muestras de resultados de aprendizaje y destrezas de investigación, así como según dominios de aprendizaje. Se seleccionaron un total de 190 artículos de investigación originales relacionados con juegos como fuentes en seis revistas arbitradas con un periodo de 12 años, de 2005 a 2017. La investigación encontró que los estudios de juegos, así como la comprensión cognitiva del campo y su conocimiento a nivel de aplicación fueron más efectivos para el aprendizaje y logros de los estudiantes en términos de retención.

Palabras clave: educación basada en juegos, tendencias de investigación, análisis de citas, revistas, revisión.

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Estudos sobre aprendizagem baseada em jogos em revistas educativas: uma revisão sistemática de tendências recentes

Resumo: Este estudo pesquisa descritivamente sobre o uso de aplicações baseadas em jogos em entornos de aprendizagem e ensino. Cada resultado empírico foi categorizado segundo o título do artigo, ano de publicação, número de citas na base de dados Web of Science (WoS) em SCI, SSCI e AHCI, teoria da aprendizagem, princípio de aprendizagem, gênero do jogo, elementos de design do jogo, amostras de resultados de aprendizagem e destrezas de pesquisa, assim como também de acordo com os domínios de aprendizagem. Se selecionaram um total de 190 artigos de pesquisa originais relacionados com jogos como fontes em seis revistas arbitradas com um período de 12 anos, de 2005 a 2017. A pesquisa revelou que os estudos de jogos, assim como também a compreensão cognitiva do campo e seu conhecimento a nível de aplicação foram mais efetivos para a aprendizagem e conquistas dos estudantes em termos de retenção.

Palavras chave: educação baseada em jogos, tendências de pesquisa, análises de citas, revistas, revisão.

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Introduction

In order not to fall behind the times, it is important to follow the developing and changing information closely. The inability of traditional learning to respond adequately to educational needs has led to the search for new learning models that can support this educational process. Learning theories have emerged in order to make the learning process more effective on the basis of various researchers and experiments. Learning is a model or system that includes numerous generalizations and principles designed to explain how people learn based on a comprehensive research result. Every theorist tries to support his/her thesis on his/her approach to the subject. The question that always needs to be answered is how learning is actualized. Currently, the most commonly accepted of the major learning theories are constructivism, cognitivism, behaviorism, and humanism (Hean, Craddock, & O'Halloran, 2009; Ertmer & Newby, 2013).

Constructivism theory, contrary to traditional teacher-centered inclination, takes place directly in the learning process and assumes responsibility for the creation of knowledge and self-learning. Based on this, there is a view that knowledge or meaning does not exist independently of the individual in the external world, that it is not transferred from the outside to the individual, but is effectively structured in the mind by the individual (Deryakulu, 2002). Vygotsky (1978), one of the pioneers of constructivism theory, argues that information is formed upon the interaction of the individual with others, and he believes that there is a relation between language development and cognitive development. Vygotsky (1978) focused on the connections between people and the socio-cultural context in which they act and interact in shared experience (Crawford, 1996). He defined the zone of proximal development (ZPD) as "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance or in collaboration with more capable peer" (Vygotsky, 1978, p. 86). According to him, learning takes place in this area. In this view, learners make sense for themselves by discovering the knowledge, rather

than taking it as it is (Perkins, 1999). Teachers guide students throughout the process and organize the classroom environment.

Cognitive theories (cognitivism), as opposed to behaviorism, focuses on the way the information is perceived by the individual and from which processes the information passes through in memory, as well as how the information is generated. Cognitivism is based on two main assumptions: that the memory system is an active, organized processor of information and that prior knowledge plays an important role in learning (Merriam & Caffarella, 1999). Learning is regarded as the result of a new behavior observed in the organism as the result of an experience. Cognitive theories focus on the conceptualization of the learning processes of learners and address the issues of how knowledge is acquired, organized, stored and reused by the mind (Ertmer & Newby, 2013, p.51). The main characteristic of the cognitive approach is that behavior and cognition are gathered under one roof and the changes are organized. According to cognitive theory, cognition transforms stimuli from the external and internal world into perception processes.

The study of the functioning of the human mind was deemed as the main theme of psychology in the early years of the field. In the beginning, and under the intense influence of philosophy, psychology focused on the individual's ability to think and understand. According to the behaviorism approach, learning is the change in one's behavior as a result of individual interaction with knowledge. Since the focus of behavioral studies is on animal and human behavior, those who adopt this approach are called "behaviorists," and the theories they develop are called "behavioral theories" (Zhou & Brown, 2015). Pavlov, Watson, Thorndike, and Skinner have provided significant contributions in the development of behaviorism that do not consider the impact of behavioral effects of mental processes on behavior (Burton, Moore, & Magliaro, 1996; Watson, 1997). Behaviorism is built on three basic assumptions: first, that learning is manifested by behavioral change; second, that the environment shapes the behavior; and third, that contiguity and consolidation principles are in a central position to explain the learning process (Grippin & Peters, 1983; Shlechter, 1991; Watson, 1997). In another aspect, those who adopt the behaviorism approach explain that learning is the connection between the stimulus and the response, meaning that repeated behaviors can be learned if they are also reinforced.

The humanistic approach (humanism) is different from the other schools, particularly in terms of the ways of considering humans. Some psychologists who oppose the perception of behavioral and cognitive approaches as a mechanical phenomenon have developed a humane approach known as the "third force" (White, 2015), according to which man is a value for himself and not a tool for a certain social/societal order or business organization.

Principles of Teaching and Learning

The reconstruction efforts to be made in the education system should include teaching content and methods, measuring and evaluating student achievement, orientation, and learning and teaching, as well as extracurricular activities. This process is to determine the technique and tools that will provide the content that will ensure the achievement of the specific goals of the students. This stage of the training program involves planning how to carry out a large-scale learning. As such, learning principles, used to make the learning process more effective at various levels, need to be applied according to different age and educational content. As a result, many principles have been developed in connection with the learning theories (Hean et al., 2009; Grippin & Peters, 1983), which are explained below.

Case-based learning, which is one of the most commonly used learning principles, is a teaching methodology that uses small group sessions to solve a vocational problem by presenting a real case, event scenario or sketch to the students (Struck & Teasdale, 2008; Alrahlah, 2016). This approach emphasizes the presence and solution of problems with well-organized teamwork, and yet it is always faculty-resource intensive (Rosenbaum, Lobas, & Ferguson, 2005).

Cognitive apprenticeship was originally developed to explain the teaching model emerging from the apprenticeship metaphor, that is, working under the skilled craftsmen in traditional societies (Woolley & Jarvis, 2007, p. 75). Under the guidance of the cognitive apprenticeship expert, the student is able to acquire professional knowledge, norms, and values, as well as gain cognitive processes to access the information he/she needs and how and where to apply it.

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Discovery learning is a teaching approach that encourages the student to arrive at a judgment based on his/her own activities and observations. This popular theory encourages learners to utilize their experience and knowledge, to use their intuition, imagination, and creativity, and to seek new information to discover facts and correlations.

It is quite difficult to distinguish problem-based learning and case-based learning from each other because, in all of these methods, real-life problems are carried into the classroom environment, and learning is provided by producing a solution for such problems. When investigating the researchers, it is seen that the most important factor in solving the problems is the way the individuals perceive the situations they face (Heppner, 1978). The situated learning theory states that learning requires the theoretical concepts learned in the classroom to be linked to practical situations in authentic contexts where they can be applied (Lave & Wenger, 1991). This theory suggests that the learning process has established itself within the culture, context, and activity in which the person is trained.

The activity theory is the basis of the interaction activity between the person who does something in essence or performs the action (the subject) and the object that causes the subject to participate in the activity. In essence, activity theory is concerned with the notion of human activity and the historical, cultural, and contextual elements that shape activity and consciousness (Camacho, Foth, Rakotonirainy, & Rittenbruch, 2017, p. 72).

The actor-network theory (ANT) deems all the elements of the system as part of the social structure, without separating it into human beings and non-human. Its theoretical framework was developed to help us understand how new actions and methods become accepted and adopted (Dedeke, 2017, p. 162).

The elaboration theory can be used to solve teaching problems thanks to its contribution to the process of material preparation in terms of instructional design. The aim of this theory is to assist education designers by combining the general content of the curriculum and the existing information on how the content sequence should be. The basic starting point is the necessity to link new knowledge and skills with a meaningful connection based on preliminary knowledge (Reigeluth, 1983). The course content tailored to a structure that is usually ordered from the general to the specific or from simplicity to complexity. The precondition for learning involves the

arrangement of presentation of content ideas (Reigeluth, 1983, p. 358) once the prerequisites for learning an idea are met.

Another approach is the stage theory of cognitive development, developed by Swiss psychologist Jean Piaget in 1969. This theory divides the cognitive development of children into four consecutive stages in the form of a sensorimotor cycle, pre-process cycle, concrete process cycle, and abstract process cycle (Bovet, 1976). In each stage, the characteristics of the stages do not change, even if they are acquired early or late.

The conditional learning theory, which is associated with the cognitive approach, suggests that both external factors and internal (mental) factors play a leading role in the learning process and that learning takes place in the human mind. In addition, learning is progressive and cumulative as newly learned information is built on previous knowledge (Hilgard & Marquis, 1961). Individuals are also affected by the ideas and values of the society they are trained in during the process of creating information. Furthermore, social interaction allows individuals to acquire knowledge and skills as well as to internalize them.

Programmed instruction is basically a form of instruction in which the content or contents are organized in small units that go systematically from simple to complex, easy to hard, tangible to intangible, known to unknown (Stanisavljevic & Djuric, 2013, p. 30). Programmed instruction consists of self-teaching with the aid of specialized textbooks or teaching machines that are structured logically and empirically and developed in a sequential manner (Oginni, 2012, p. 200). In this process, the teacher places active participation at the center without the need for direct involvement, allowing the student to progress according to his or her learning speed.

According to the social learning theory, learning occurs by observing the world surrounding the individual, mimicking the behavior of others and taking others as examples (Bethards, 2014, p. 65). According to Bandura (1985), who developed this theory, in the first stage of social learning, the observer focuses on the person he/she takes as an example in order to model his/her behaviors successfully. In the second stage, the observer keeps the behavior of that role model in his mind. The phase of keeping the behavior of the person used as an example by the observer is actualized through visual images and verbal symbols. In the third stage, the application phase (reproduction) is the process by which the observer can repeat the behavior of the model he/she uses as an example or integrate this behavior with his/

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her own behavior. The final stage is the happiness and pleasure provided as a result of that behavior (Bandura, 1985).

The cognitive load theory argues that overloading the students can have a negative impact on their working memory capacity (Ayres & Paas, 2012; Kirschner, 2002). As such, this theory deals with the learning of complex cognitive tasks that arise with the amount and interrelation of the information that must be processed simultaneously before the beginning of the learning process and focuses on the cognitive processes of the students.

The load theory focuses on the events that ordinary people face in their lives and the fact that people do not base their conclusions on internal or external factors (Demetriou, 2011, p. 17). In other respects, the load theory also has an important place in social psychology, and it attempts to explain the reasons of humans with internal (intuitions, attitudes and skills) or external (norms, luck, tradition, fate and law) factors. Humans make causal explanations of daily activities in order to reveal the activities, as well as the behavior of other people and the underlying factors of such behaviors. These principles deal with the acquisition, processing and preservation of knowledge during learning. In this study, learning principles used in game-based education studies are examined.

Trend Analysis in Education Research

The attractive features of computer games that keep the users occupied and the potential they have led to new approaches in every field, including the field of education. Games offer an environment where learners are actively interested in and are able to continue their activities individually, as well as opportunities to learn by doing-living. Digital games have been used as effective tools for facilitating learning in various domains such as computer science, communication science, language-learning, engineering, health, and education (Barzilai & Blau, 2014; Giannakos, 2013; Hao et al., 2010; Hong, Cheng, Hwang, Lee, & Chang, 2009; Qian & Clark, 2016; Ott & Pozzi, 2012; Chang, Lai, & Hwang, 2018).

All the models and theories developed in our age emphasize the importance of using instructional technology in education in terms of its positive effect on learning. It is necessary for individuals and societies to change themselves in the age when information is being changed and renewed at any time.

There are a number of studies on the effects of digital games on learning in various fields (Braghirolli et al., 2016; Chang et al., 2017; Hong et al., 2009; Moreno-Ger et al., 2008; Ott & Pozzi, 2012; Woolley & Jarvis, 2007), which will be briefly explained below.

First, a study by Chang et al. (2017) examined the differences in flow experiences between game-based learning and non-game-based learning groups and on the types of intrinsic, relevant, and extraneous cognitive load. One hundred and three participants were assigned to the experiment group (50 students) and the control group (53 students). The results indicated that the flow-based learning group had more flow experience than the non-game-based learning groups. Another difference is that game-based learning groups differ from another group in terms of their ability to concentrate on their own learning as well as the ability to control.

In another study on the use of educational games in learning environments, some requirements for the educational design in the online education are analyzed and a general game design that contains the adaptation, as well as the evaluation features, is recommended (Moreno-Ger et al., 2008).

Another study on the use of games in engineering education assessed the use of educational games as an introductory activity in the first year of the undergraduate program in industrial engineering (Braghirolli et al., 2016). In this study, the effects of the game on the students were evaluated using the questionnaire. In light of the acquired information, it was found that the educational games play a successful role in terms of both a better understanding of the course content by the students and the participation of the students in this process.

A pilot study was also conducted to test whether a multi-player online video game provides a meta-cognitive therapeutic benefit for people with brain injuries (Colman et al., 2014). From a series of studies on the functioning of video games in various fields, from social sciences to science, one study (a digital humanities curriculum) tried to explain how video games function in various courses (Hergebrader, 2016). As a result of the investigations, it was determined that most of the educational problems encountered are caused by the traditional teaching methods.

Several studies approached the trend of game studies differently in the last two decades. For example, Alias et al. (2013) reviewed the trends in research in the field of YouTube published in seven educational journals (the *Turkey Online Journal of Educational Technology* [TOJET], *Educational*

Technology & Society [ET&S], *Educational Technology Research & Development* [ETR&D], *Computers & Education* [C&E], *Learning and Instruction* [L&I], the *Australasian Journal of Educational Technology* [AJET] and the *British Journal of Educational Technology* [BJET]) using content analysis from 2007 to 2012. Maurer and Salman Khan (2010) investigated the e-learning studies published in the Social Science Citation Index (SSCI) journals (the *Journal of Computer Assisted Learning, Computers & Education,* the *British Journal of Educational Technology, Innovations in Education* and *Teaching International and Educational Technology Research and Development*) and two conferences (Educational Multimedia, Hypermedia & Telecommunications and IEEE International Conference on Advanced Learning Technologies) by content analysis and scientometric method between 2003 and 2008. In another study, Shih et al. (2008) examined a content analysis of studies in the field of cognition in e-learning published in five major journals in the Social Sciences Citation Index (SSCI) from 2001 to 2005. Bray and Tangney (2017) reviewed 139 recent empirical researches related to the use of technology in mathematics education, developing a classification system for technology interventions in mathematics education by technology, learning theory, aim, and level of integration (SAMR). Finally, Chang, Lai, and Hwang (2018) conducted a meta-review by analyzing the mobile learning studies in nursing education published in academic journals from 1971 to 2016. In their study, they analyzed the trends of research issues, method application domains, and learning strategies.

Materials and Methods

Data Collection

The material of this study includes articles published from 2005 to 2017 in education journals classified under the subject category of game studies in the *2017* edition of *Journal Citation Reports.* They used the *Social Sciences Citation Index* (*SSCI*) for journal selection criteria because SSCI journals are generally commonly recognized as having higher research quality, longer histories, and easier accessibility in academia (Zhang & Leung, 2014).

The first stage involved a keyword search for all articles linked with terms such as *game, game-based learning, educational game design, video game, serious game, design-based learning, educational game, augmented reality,*

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entertainment game, mobile game, gamification, ubiquitous learning, online role-playing games, mobile augmented reality, mobile games in the major technology-based learning journals databases—Scopus and EBSCOHost. Original research studies, letters to the editor, editorials, book chapters, and case reports were excluded.

The coding scheme for this study was adopted from previous researches (Hwang & Wu, 2011; Qian & Clark, 2016; Kim et al., 2018; Miragaia & Soares, 2017). The raw data was collected for all original research and review articles published in *Computers & Education*, the *British Journal of Educational Technology*, the *Journal of Computer-Assisted Learning, Interactive Learning Environments, Educational Technology Research and Development*, and the *Journal of Science Education and Technology* between 2006 and 2016. Six peer-reviewed scientific journals were selected because they are all categorized as being educational-technology-related in the SSCI (Education & Educational Research). For the purpose of the study, the following information for each article contained all the information about that paper, such as paper title, year of publication, the number of WoS citation index in SCI, SSCI and AHCI, learning theory, learning principle, game genre, game design elements, learning outcomes and skills research samples, and learning domains. A total of 7031 research articles were published in the six peer-reviewed journals during the 12-year period from 2005 to 2017, including a total of 190 originally research articles related to the game as the sources. These prestigious peer-reviewed journals are published on a monthly, quarterly, tri-annual, or semiannually basis. The journals cover basic, applied and practical studies with varying types of researchers, such as historical, descriptive, experimental researchers and other theoretical issues related to education science. In this study, the two coders are the researcher of this study, who received a Ph.D. degree in the field of communication and education. The reliability of coding was measured using Cohen's kappa, and the inter-rater reliability was 0.87 (Cohen, 1960).

Computer and Video Game Genres

Video game genres are classified according to their gameplay characteristics, player activity (or *gameplay*, or *interactivity*), characters, experiences and emotion. Over the past 30 years, game researchers focused on specific game genre design. There are a variety of games genres but there is not

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one standard system of classification (Hong et al., 2009, p. 414), because game designers are trying to create their own genres to be able to catch potential players. The game industry generally used the 12 game genres (Salen & Zimmerman, 2004; Gros, 2007). Video game genres are traditional games (e.g., Street Fighter, Tekken, The King of Fighters), sports games (e.g. FIFA '18, NBA 2K18, Madden NFL '18), driving/racing video games (e.g., Need for Speed, Dirt Rally, Grand Prix Legends), educational games, rhythm games action and adventure games (e.g., Tomb Raider, BioShock, Prince of Persia), first-person shooter (e.g., F.E.A.R., Half-Life, Counter-Strike), simulator games, strategy games (e.g., Warcraft, Rise of Nations, Age of Empires), role-playing game (e.g., South Park, Pokémon Yellow, Super Mario), massively multiplayer online role-playing games (e.g., World of Warcraft, Guild Wars, Star Wars Galaxies).

Categorization of Outcomes

The term *21st-century skills* is generally used to refer to certain learning and innovation skills, such as collaboration, creativity, innovation, critical thinking, problem-solving, communication, information literacy, media literacy, technology literacy, flexibility, leadership, and productivity. Other categories are identified skills (social skills, motor, spatial, and visual skills), knowledge acquisition, behaviors, and attitudes.

Research Samples

The sample was categorized with previous studies in mind (Qian & Clark, 2016). Research samples are k-5 (n=21), middle school (n=40), high school (n=25), higher education (n=61), teachers (n=7), adults (n=11), and not specified (n=25).

Game Design Element

Game design elements were developed by Aarseth et al. (2003) in the light of experiences gained in previous studies (Anderson, 2011; Deterding et al., 2011). Game design elements are the challenge, collaboration, competition, exploration and discovery, goals and tasks, points, badges, performance

graphs, leaderboards, level and progress bars, surprise and uncertainty, meaningful stories, avatars, time pressure, and feedback.

Learning Domains

The learning domain categories used in the analysis are science, mathematics, language and art, social science, engineering, health, others, and not specified.

Statistical Analyses

This study used content analysis and citation analysis with the statistical software packages Excel 2013 (Microsoft Corporation, Seattle, WA) and SPSS 23.0 (SPSS Inc., Chicago, IL, USA) were used for data analyses. Content analysis is helpful in terms of increasing the quality of journals and the decisions and policies made for allocating resources and funds and proposing the future directions for the field (Maurer & Salman Khan, 2010). The 5-year journal impact factor published by Thomson Reuters in the *Journal Citation Reports* (JCR) is defined as the average number of times articles from the journal published in the past five years have been cited in the JCR year (Bensman, 2007; Pendlebury, 2009). A period of ten years is used to make general observations over the phenomenon in game studies in social sciences. Therefore, this paper aims to contribute to bridging this research gap, by investigating the trends of studies in the field of game-based learning studies that were published in six major journals included in the Social Science Citation Index (SSCI) from 2012 to 2016.

Data Analysis and Results

In the next step, the quantitative interpretation of the findings was described, giving implications on what issues have not been adequately dealt with in the field so far. When the journals in the scope of the research are examined, computers and education takes the first place, according to the 5-year impact factor (5-yr IF) (see Table 1). This journal is the first in the total number of articles and citation. Based on the 5-year impact factor and the number of references, the *British Journal of Educational*

Technology takes second place and the *Journal of Computer-Assisted Learning and Interactive Learning Environments* takes third place.

Table 1. Number of original research articles in six education journals in 2005–2017

Journal	5-yr IF	Sum of the Times Cited	h-index	Avg. Citations per item	Citing Articles	Total Article
Computers & Education	5.047	65.439	105	26.28	30.815	2490
Brit J Educ Technol	2.532	17.676	54	8.61	12.643	2109
J Comput Assist Lear	2.415	11.472	53	19.85	8.709	592
Interact Learn Envir	2.138	3.265	26	5.89	2.712	554
Etr&D-Educ Tech Res	1.652	49	4	4.08	48	660
J Sci Educ Technol	1.424	4.735	28	7.56	3.760	626

Upon examining the studies included in the journals according to the learning theories, it was seen that these theories are included in 99 articles. Regarding the distribution of the theories, most of them were produced in cognitivism (n=54), constructivism (n=36), humanism (n=6) and behaviorism (n=3). When providing a higher level of learning, the questions of whether the game-based learning is necessary for each activity and which method should be used is deemed as a significant problem. It also suggests the idea of evaluating game selection and level when students are thought to be at different cognitive levels.

In Table 2, when the distribution is analyzed according to the learning branches and the branches of science that constitute the sample of the research, it is seen that the non-specified group is predominant in all theories. In many studies, constructivism is proposed as a learning model that will provide optimum benefits for students at different levels. The second process-oriented approach is the cognitive learning theories, which suggest that of the processing of information, such as comprehension, perception, thinking, coding, remembering, should be the subject of psychology instead of observable and measurable aspects of human behavior, and that individuals take an active role in the learning process.

Table 2. Overview of game studies published in six education journals between 2005 and 2017

	Engr.	Health	Lang. & Art	Math.	Science	Social Sci.	Others	N/S
Constructivism	1 (2.8%)	2 (5.6%)	3 (8.3%)	2 (5.6%)	4 (11.1%)	0 (0%)	0 (0%)	24 (66.7%)
Cognitivism	1 (1.9%)	3 (5.6%)	3 (5.6%)	4 (7.4%)	4 (7.4%)	2 (3,7%)	1 (1.9%)	36 (66.7%)
Behaviourism	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (100.0%)
Humanism	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	6 (100.0%)
Total	2 (2.0%)	5 (5.1%)	6 (6.1%)	6 (6.1%)	8 (8.1%)	2 (2.0%)	1 (1.0%)	69 (69.7%)

After examining the publications in the journals, it is seen that there are very few games in which a certain professional skill is measured. In the thematic field of constructivism theories, science (11.1%) comes in first, and language and art takes the second place. In the distribution of the theories of cognitivism, games with the themes of science (7.4%) and mathematics (7.4%) are predominant. There is no specific application domain in which the behaviorism and humanism theories are involved.

When studying the game studies in educational technology journals, problem-based learning approaches (n=15), cognitive load theory (n= 15), flow theory (n= 11), case-based learning theory (n=9), discovery learning (n=9) and cognitive development (n=6) theories were found to be in the forefront. In order to understand structurally complex teaching materials, students have to deal with many interactive aspects of knowledge in working memory.

In an ideal game, as the player learns the game and increases his/her skill, the difficulty of the game is expected to increase accordingly. In the characteristics, flow theory is used in game studies to provide a concentration for the students in the lessons. Here, besides the positive effects of the games, the negative effects such as the loss or deterioration of time perception, loss of control emotion, high stress, and excessive force of the body are also emphasized.

Nowadays, in the field of education, one of the approaches in which the students will be active with the teacher, especially in the student center and in the learning process, is case-based learning, which involves the students working individually or in groups on the problem situations. When the study of games was examined, it was seen that case-based learning instructions were frequently used in simulation-style games.

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Upon examining the studies, it is seen that the level of discovery of the in-game information by the students is being measured. It is necessary to encourage students to solve the problem on their own or in small groups, to make inventions and to satisfy their curiosity. The theory of social learning is based on the assumption that people can only make inferences by observing the behavior of others around them instead of trying them out.

The problem-solving ability that plays a key role in solving the problems arising in social life is an important issue that has long been of interest in the education system. According to constructivist understanding, the development of problem-solving skills in students and active learning is increasing significantly with the use of games. The analysis of the articles showed that the problem-solving skills of the students were the most examined subject (n=29, 5.1%).

Another important skill group in game studies are motor, spatial and visual groups (n=26, 4.6%). Nowadays, devices such as augmented reality, virtual reality, and haptic devices are used to control the game as if the player were in the game instead of the keyboard or joystick. It is seen that motor, spatial, visual skills of the students, especially the handicapped, are measured by games. These systems will be modified and enriched by the computer to appeal to the human senses and move their senses and to be presented to the perception of the emerging new reality.

There are many types of researchers (n=23.4 %) about the possibility of a common approach or understanding of attitudes and behaviors of students in an educational environment after classroom and out-of-class relationships. These researchers aim to form a conceptual structure by examining the causes of attitude and behavior changes. When the studies were examined, the effects of critical thinking ability on student achievement were examined (n=19, 3.3%). In order for the course content to be effectively taught, the students need to operate the thinking process effectively; it is often said that they will memorize much information in the opposite case.

Collaborating learning activities seem to have an important place in game-supported training (n=13, 2.3%). The assumption that, during the joint study that requires collaboration, children with different skills help each other is the basis of the collaborative type of learning. Particularly in games like MMORPGs, players have to achieve success through cooperation. This collaborative environment is designed for students and it creates a space where they can freely explain, discuss, and listen to each other with

personal care. In this process, learning takes place after helping and the acquired information becomes permanent.

Studies on creative thinking (n=11, 1.9%) reveal that the creative thinking process is learnable and that this ability is not merely monopolized by superior people. Other learning outcomes in the survey include knowledge acquisition (n=11, 1.9%), social skills (n=11, 1.9%), communicating (n=10, 1.8%), technology literacy (n=7, 1.2%), flexibility (n=6, 1.6%), information literacy (n=6, 1.6%), media literacy (n=5, 0.9%), initiative (n=4, 0.7%), leadership (n=3, 0.5%), and productivity (n=3, 0.5%) .

There are many game design elements, such as the story of the game, roles of the players, aim, and objectives of the game, feedbacks, game levels, control limits of the player, passing rules between the levels, reward and punishment mechanism. These elements vary according to the type of game and the target group. All of these elements must be found in all of the games. What is important is that these elements are applied in a balanced way in relation to each other. While designing educational games, in particular, elements that develop algorithmic, analytical, creative and design-oriented thinking skills are embedded in the game. After observing the design elements of the games examined in the research, feedback (n=97, 17.1%) appeared to be in the first place. Among the other factors, these ones are in the foreground: goals and tasks (n=92, 16.2%), points (n=62, 10.9%), performance graphs (n=55, 9.7%), exploration and discovery (n=52, 9.2%), competition (n=33, 5.8%), surprise and uncertainty, time pressure (n=28, 4.9%), and avatars (n=24, 4.2%). Meaningful stories (n=17, 3%), collaboration (n=11, 1.9%) and leaderboards (n=7, 1.2%) were considered as the least studied game design elements in the articles.

The quality of a journal is mainly related to how strictly it has been undergoing an evaluation process and how many times its publications were mentioned in other journals (Rousseau, 2002). Many criteria have been developed to monitor the quality of scientific publications, to measure and evaluate its impact on other studies. The h-index is used in all journals because it is consistent with today's measurement methods and because it offers a general evaluation. The "citation" is an important measure in that it shows how effective the work is. It is calculated by the Web of Science (Thomson Reuters), Scopus (Elsevier) and Google Scholar (Google) databases because those are more accurate than any other criterion. The Journal Citation Reports, published annually by the Web of Science (Thomson

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Reuters), two measurement results for each journal such as Impact Factor (IF), and the 5-Year Impact Factor are publicized. Table 3 shows the total number of citations and the average number of citations in terms of learning theories. The total number of citations of 98 articles in which the theories are included is 2889 and the citation average for each article is 29.5. When the articles in which the constructivism theory are examined, it is seen to take first place in terms of citation average (M=39.1). The cognitivism theory (n=53) and humanism theories (M=28.3) are the most studied theories by citation average.

Table 3. Impact indicators of selected articles with respect to each learning theory

Theory	N	Mean	Sum	% of Total Sum	% of Total N
Constructivism	36	39.1	1406	48.7%	36.7%
Cognitivism	53	24.6	1302	45.1%	54.1%
Behaviourism	3	3.7	11	0.4%	3.1%
Humanism	6	28.3	170	5.9%	6.1%
Total	98	29.5	2889	100.0%	100.0%

Table 4 contains citation distributions of the articles according to their learning outcomes. Out of the articles in the scope of the research, the outputs of the study in 87 studies were specifically addressed, while the outputs of 101 studies were not examined. In order not to affect the mean values in the citation distributions, only one study in each category was taken. "Discovery learning" is the most cited learning technique with 423 citations (n=9, M=47), followed by load theory (n=15, M=26.6) with 399 citations, case-based learning (n=9, M=26.6) with 364 citations, problem-based learning (n=9, M=40.4) with 364 citations, flow theory (n=11, M=28.8) with 317 citations, and flow theory (n=7, M=24.3) with 170 citations.

Table 4. Impact indicators of selected articles with respect to each learning principle

Principle	N	Mean	Sum	% of Total Sum	% of Total N
Case-based learning	9	40.4	364	8.0	4.8
Cognitive development	6	7.5	45	1.0	3.2
Cognitive load theory	15	26.6	399	8.7	8.0
Discovery learning	9	47.0	423	9.3	4.8
Experiential learning	7	24.3	170	3.7	3.7
Flow theory	11	28.8	317	6.9	5.9
Not specified	101	19.0	1914	42.0	53.7
Problem-based learning	15	23.9	358	7.8	8.0
Self determination theory	5	1.0	5	0.1	2.7
Situated learning	5	25.0	125	2.7	2.7
Social development theory	2	47.5	95	2.1	1.1

Discussion and Conclusions

People who live in the same society with different cultural characteristics do exhibit different patterns of behaviors in many value systems, and the reason for it is that they have different personal values. It is a key concept in making entertaining/funny classroom environments. An indispensable part of human life, the game is the primary source of our learning. The constructivist theory, which advocates the view that knowledge emerged as a result of a structuring in the human mind, interacts with game-based instruction in terms of teaching processes and technologies in this context. The constructivist learning theory is another approach that has become increasingly popular in recent years, where students have an active role in the learning process and interact with each other. Constructivist learning environments are environments in which students collaborate, interact with various learning environments and materials, experience rich, primary-level learning experiences, and are able to research, question, problem solve, and think critically and creatively with their own learning responsibilities. In this process, the individual characteristics and differences of the students are taken into consideration. In constructivism, each acquired knowledge

sets the ground for the construction of the next knowledge, because new information is built on preconfigured information. Constructivist theory is based on the view that people are building on their own knowledge, rather than conveying the information of others as they are to the individual. The most important feature of this theory is that it allows learners to construct, generate, interpret and develop knowledge.

Whether game-based learning methods differ in terms of cognitive learning levels of learners is a condition that needs to be investigated. Individuals are learning not in the form presented to them but in the form they have in their minds. The individual constructs his or her prior learning in the mind, thus providing continuous activity. The student can easily communicate with the environment and with the teacher who will guide him/her. In addition, the end of stimulation in the learning process has attempted to understand the internal processes that take place in the human mind, contrary to the behavioral approach, which suggests that the reactions that emerge can be observed. It is thought that more information is transferred to the students during the game according to the classroom environment and that the information obtained in this process is more permanent. This is because, in the game environment, the audiences and visual stimuli enable the student to enter an active position as a character in the game, coding the information into his memory and making it more permanent. Thus, instead of seeking out the causes of behavior and connecting it to objects, the subject of behavior was rediscovered.

Behaviorism perceives a person both as a consumer within the environment and a product of the environment. Therefore, it is also taught that the student is interested in the lesson and is actively involved in teaching experiences. Stimulants are internal and external events that activate the organism. The sound we hear, the light and the pictures we see, the taste we experience is a stimulus for us. It is believed that game-based learning has reinforced learning because of the excessive stimulant elements in learning. In addition, the scores and prizes earned during the game and the losses resulting from the mistakes made in the game are regarded as the prize-penalty system in the behaviorist approach. The common feature of the articles in this category is that, instead of suppressing the main objection of unwanted behaviors, the behavioral approach is to gain desirable behaviors through games.

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According to the humanist approach, the single and basic instinct of humans arises from the necessity of self-realization. What this approach wants to achieve is to use these skills and resources by directing them to the areas that are right for them. From this point of view, it has been examined how a person follows a choice rather than a result-oriented (score, reward) game.

Integrating the basic principles of learning theories and methods with training sessions can make both the training process and the training outcomes productive. Game studies at this point are to provide an effective learning environment by facilitating the processing of visual and auditory information, as well as being permanent in memory. In this sense, effective learning ensures high performance without overloading the working memory capacity.

Problem-based learning differs from the conventional learning methods and it's an approach in which the students acquire decision-making, critical thinking capabilities as well as problem-solving skills. This method helps students to develop high-level skills such as analytical thinking, reasoning, decision making and problem-solving. This pedagogical approach, in which the teachers are placed in a central position in the learning process of the students, is working in small groups to find solutions to real world problems. This method, which is used in order to gain a sense of a subject or skill, takes place when the learning process students first classify the problems encountered in everyday life in small groups and classify them into alternative solutions.

The goal is that the students will be able to produce a solution by examining whether the ideas and drafts actually work in the evaluation stage in the face of an event. During the game, the student tries to solve the problem by choosing between alternatives suitable for his/her learning style. Depending on the differences in the learning styles of the learners, the students will be able to obtain inferences in the problem-solving process, where they can develop different strategies and use models and bring different interpretations of the results. During the game, the player has clear goals and clear moves to meet them, and the whole attention is focused on that game. The excessive increase of the difficulty of the game causes extreme tension, while extreme decrease causes difficulties. Flow theory is often used in game research to explain the states on which the players are concentrating and getting lost in thought. All children have a desire

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to learn, but, in order for this to happen, it is necessary to include activities in the teaching environment that will stimulate the students' curiosity and desire of success, to encourage them to work together and provide "discovery" of knowledge. The child needs to be curious to boost his/her desire to explore. Critical thinking, which has been debated in many areas in recent years, has become one of the most important topics, especially at the heart of educational settings. It is the ability to think flawlessly through the mental processes, the strategies used to solve problems, and the disciplined mode of thinking, and it is based on the ability and tendency to gain, evaluate and use knowledge effectively. Critical thought consists of skills integrated with life that can be taught to human beings of all ages.

Considering the results of this study, it can be argued that more studies that investigate the relations between Virtual Reality (VR) and Augmented Reality (AR), personalized learning, person detection, tracking, motion analysis, face analysis, and other perceptual technologies, methods and tools should be investigated.

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