

## DIGITAL GAME-BASED LEARNING MODEL AS AN EDUCATIONAL APPROACH



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### Abstract

Today, the rapid development of technology has also affected the existing learning processes. In addition, this development has made it necessary for children to develop skills by the needs of the 21st century. In this research, an alternative to the question of how we can support and update learning activities suitable for our age is presented. Digital game-based learning concepts are explained in the light of the literature and suggestions on how to use them from early childhood are presented. Game is the most important supportive activity for development areas in early childhood. It also similarly affects learning processes. Learning with play makes the child more active and makes him excited about learning. This increases the motivation to learn. According to the research, when DGBL is used effectively, it has been seen that children support many 21st century skills such as critical thinking, problem-solving, and cooperative learning. This review demonstrated the importance of combining learning and game of digital technology used as an education model. In addition, Practical recommendations are presented for using technology in preschool children.

## 1. Introduction

Most people believe that games are interesting, effective, and have a place in learning, and this belief is supported by many studies (Egemen, Yılmaz, Akil, 2004; Özer, Gürkan, Ramazanoğlu, 2006; Ayan, Memiş, 2012; Metin, Mercan, Kavak, 2017). According to the researchers, the play includes the most effective socialization and learning processes common to all cultures. Games use it as a teaching strategy. The cognitive benefits of games have been supported by different theories, especially Piaget (1962). Games, which are frequently used in learning activities, increase cognitive flexibility capacity, embodied learning, and most importantly, make the learning process enjoyable.

The developments in the field of technology and the effect of technology on human life have caused changes in many areas. One of these changes is the use of digital games for educational purposes in early childhood. 21st-century children found themselves in technological tools almost as soon as they were born and they built their worlds on these tools. Computer, mobile phone, tablet, etc. Vehicles have been an indispensable part of their lives since their early days. Today, individuals in early

childhood interact too much with technological tools have led to the digitalization of the game out of traditional patterns. Therefore, digital environments attract their attention and motivate them more to do something in the digital environment. Breaking with traditional education and games, generation Z is referred to as "digital natives". This generation, who grew up with exposure to computers and the internet and are called digital natives, has different learning characteristics from the X and Y generations. Digital natives need multiple streams of information, prefer inductive reasoning, want frequent and rapid interactions with users, and have visual literacy skills. All of the mentioned learning styles are features that match well with the "Digital Game-Based Learning/DGBL" (Van Eck, 2006). Digital game-based teaching has carried the concept of the game far beyond the traditional definition of "leisure time activity", and the game; has transformed individuals into action with outcomes that force them to learn, explore, think and research.

As mentioned, the process of thinking and processing thinking is completely different for today's children compared to the generation before them. Therefore, it is noteworthy that teachers should use digital-based games as teaching materials in the

classroom to meet the educational needs of the generation called "digital natives" (Princecky, 2001b). Most recent studies show that DGBL has positive effects on children (Van Eck, 2006).

If we consider education as the state of meeting the needs of the individual, the changing thinking and processing processes of today's children should not be ignored to meet their educational needs. Therefore, the importance of breaking out of traditional learning patterns and using the digital game-based teaching model effectively is seen once again. Considering all these situations, it is possible to see that DGBL, on the one hand, meets the educational needs of individuals, on the other hand, helps them to enjoy themselves and to include them in their learning processes. Keeping in mind that today's children lead a life intertwined with technology from an early age, it is undeniable that digital tools should be used as a teaching model to benefit more effectively from early childhood. The main purpose of this research will be explained conceptually and with examples, of how DGBL can be integrated into classroom environments, especially in early childhood. Thus, the effects of digital games, which are seen as entertainment tools, and how they will be associated with learning processes will be presented from a different perspective.

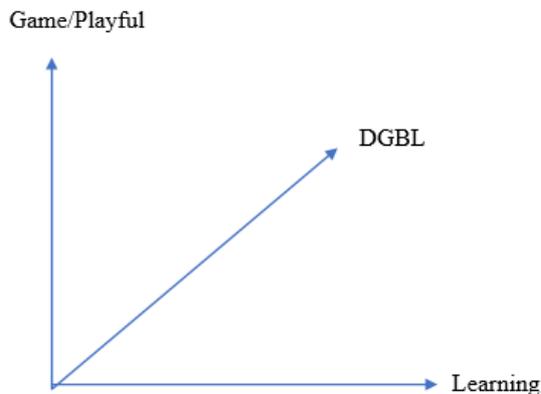
## **2. Digital Game-Based Learning Model (DGBL)**

Thanks to the technology that has become available in classrooms today has drastically changed teaching as well as learning. Thus digital game-based learning has been a prominent teaching method (Juraschka, 2019). DGBL is a teaching method that incorporates educational content or learning principles into video games to engage students. Digital game-based learning applications make use of constructivist education theory. Based on constructivist education theory, DGBL combines educational content with a computer or video games and can be used in almost all courses and skill levels (Coffey, 2009). DGBL is a pattern that utilizes the game as a medium for conveying the learning contents, leveraging the power of computer games to captivate and engage users for the purpose, such as to develop new knowledge and skills. DGBL is also fined as an application that uses the characteristics of video and computer games to create engaging learning experiences for delivering specified learning goals, outcomes, and experiences (Zin, Jaafar, & Yue, 2009). DGBL offers a delicate balance between in-class lessons and educational gameplay. Teachers introduce students to new concepts and show them how they work. Then students practice these concepts through digital games (Juraschka, 2019). In DGBL, digital games are considered as non-traditional innovative and motivation-enhancing educational tools that can create opportunities and achieve new goals in the learning process.

In DGBL, digital games are used to promote learning and communicate knowledge. While game-based learning is a concept that has been used for many years, the term DGBL was first used by Prensky (2001b), a leading researcher in the field of DGBL, in his book "Digital Game-Based Learning". Prensky (2001b) states that digital game-based learning is in the "20th century", a global technology explosion where the next generation of students in grades K-12 are starting to do all their work with access to technology. He explains that it emerged in the last decades of the 20th century. Prensky (2005) argues that DGBL is based on two fundamental propositions: "radical change in learners and creating motivation to learn in new ways", emphasizing the new generation called digital natives. Other proponents of digital game-based learning support this view, arguing that DGBL provides learning opportunities that engage students in interactive teaching and helps prepare them to participate in the global, technological society of the 21st century (Coffey, 2009).

Research indicates that preadolescents play digital games, on average, between four to six hours per day (Homer, Hayward, Frye, & Plass, 2012). and it's thought using similar gameplay in the classroom can increase engagement and overall learning in classes (Juraschka, 2019). DGBL is also in line with current research stating that digital games can be used as educational tools because they provide an environment for problem-based learning by combining the child's participation in the game in parallel with game and learning. Toprac (2011), researched how to design a motivating educational game for middle school students using digital-game-based learning techniques in a problem-based learning environment. Results showed that students believed that their interest in learning science was influenced by their self-efficacy, attainment value, intrinsic value, utility value, cost perceptions, and knowledge. Erhel and Jamet (2013) examined the effects of two types of instructions on digital game-based learning and the results showed learning is entertainment and deeper and instruction has beneficial feedback. Meanwhile, many scholars recognize DGBL which enables the learner to conduct experiments and test hypotheses as a promising platform to foster students' science knowledge (Hussein, Ow, Cheong, Thong & Ale Ebrahim, 2019). A distinct balance needs to be reached between types of games to create something educational and fun for students (Juraschka, 2019). DGBL has a huge learning potential to engage learners in complex learning environments. Studies have suggested that not only can DGBL provide opportunities for entertaining learning, but also it is an eclectic learning model that enables to use and embodying of different learning situations (Huang & Johnson, 2002; Pannese & Carlesi, 2007; Huang, Huang & Tschopp, 2010). The figure below shows that DGBL should have a good balance between

game participation and learning. If the balance is disturbed, the game may become addictive or more educational and less interesting/fun rather than expected educational outcomes (Raptopoulou, 2015).

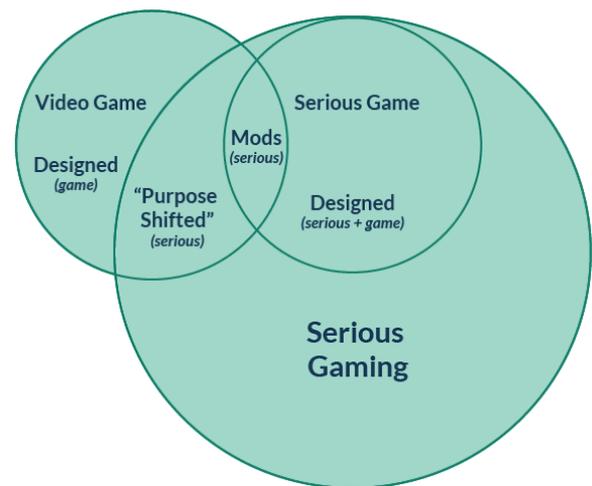


**Figure 1.** Digital game-based learning- two-dimensional process. *Source: Prensky, (2005)*

### 3. Components of DGBL

DGBL includes activities that can range from completing very simple tasks to developing complex problem-solving skills. If the right components are used, learning will become more fun with pedagogical activities that appeal to all ages by using DGBL, while children's participation in learning processes will be supported and their desire and curiosity will increase.

To differentiate games that are appropriate for helping students learn in the classroom from those that are used purely for entertainment could be classified games into two categories like video games and serious games. While video games include games designed for pure entertainment; serious games include games designed to teach or help students practice specific skills or content and combine and integrate both teaching and entertainment (Pitarch, 2018). Also intended for fun, some video games can be shifted to teach different skills and bring them into the realm of serious gaming. On the other hand, serious games can incorporate elements of video games to make them more entertaining and engaging (Alvarez & Djaouti, 2011).



**Figure 2.** How Digital Game-Based Learning Improves Student Success: *(Jurashka (2019)*

DGBL offers a wider learning environment to learners and teachers by including game components. Above all, games should keep learning and participation at a high level.

**Immersive and Fun:** games need to have a fun-loving side. Otherwise, the child may not want to continue the game.

**Rules:** Every game must have rules and clear guidelines. A guide should be arranged that students must follow when they are involved in the game.

**Feedback:** The game interface should be designed to give instant feedback to the learners.

**Multimedia technology:** It is very important to use visuals, effects, and sounds that appeal to the senses in the game.

**Challenge:** Each student has different abilities for each game. The difficulty level of a game should match the skills students have.

**Reward:** It is one of the ways to motivate students to keep playing and to overcome the challenges of each game level. For this reason, it is important to give students rewards that will reinforce their participation to achieve the targeted gains (Zin, Jaafar, Yue, 2009).

Deubel (2006) when teachers choose games; stated that they should pay attention to whether it will cause too much competition, determine the target age level and difficulty level of the game, and not expose them to any discrimination. It is also important that the teacher's role be clear, that the rules and objectives are clear, and that they provide immediate feedback. In addition, it is another important factor that students have an

interactive role not only with the game but also with other students.

#### **4. Benefits of DGBL**

When the effects of DGBL on children are examined in the research, it is seen that the benefits of DGBL such as increasing motivation, supporting critical thinking and problem-solving skills, increasing interaction and quick feedback come to the fore.

According to Deubel (2006), DGBL has the potential to attract students' attention, motivate learning, and provide permanent learning and practical learning experiences by supporting long-term memory. It also draws attention to the function of digital game-based learning in improving vocabulary skills and increasing cognitive speed. In this learning model, the critical thinking skills of children are supported by the feedback received during the game (Princeky, 2001a). In addition, DGBL helps children to create their learning processes (Anderson et al. 2009). This situation increases children's self-confidence and helps them to come up with more creative ideas. It also removes the monotony of teaching and makes it more enjoyable.

The use of technology provides opportunities for children to benefit from deep learning and to encourage self-learning at a level that is capable of further research (Garcia & Mangaba, 2017). In digital game-based teaching, the child is at the center of teaching. In this process, while the child does not feel any pressure to learn the information, on the other hand, he is exposed to information every second and is open to new learning opportunities (Tam & Hui, 2011).

Griffiths (2002) states that these games are effective in supporting children's interest in learning new subjects and their computer skills and that using digital games also has benefits for children with special educational needs. For example, video or digital games have a calming effect on a seven-year-old with autism; drawing attention to research data suggesting that adolescents with attention deficit disorder may experience improvements in "classification, sociability, and organizational skills" while playing educational video games. He also mentions the possible benefits of using video or digital-based games for diabetes and other diseases that require rehabilitation.

DGBL differs from traditional learning methods that make the individual passive in the process, as it makes them an active participant in the process. In addition, the fact that students receive instant feedback during digital game-based learning, the speed of asking questions is much higher, and supporting actions such as being in control increases their learning motivation and skills such as self-confidence and self-efficacy (Mayo, 2009). Compared to traditional instruction, digital game-based learning

has shown to be more effective in improving students' mathematical learning (Juraschka, 2019).

Researches on children at early ages show that digital games support children's problem-solving skills and creativity and increase their collaborative work (Brooks and Sjöberg, 2020a; Brooks and Sjöberg, 2020b). Kailani, Newton, & Pedersen (2019) showed in their work that the most prominent elements of digital games are collaboration, interaction, and feedback. In addition, they concluded that digital game-based learning encourages learning motivation and participation by enabling children to have high interaction, and thus positively affects problem-solving skills, as it leads to insistence on finding solutions to the problems addressed in the game through increased motivation.

#### **5. Limitations of DGBL**

While it seems that DGBL has some benefits and may be of interest to children, there are also opponents to this type of learning model and some disadvantages of using video or digital-based games in the classroom are highlighted. Some researchers argue that digital games can be more of a distraction than a typical learning tool, and the purpose of the games may not always be as desired. For this reason, Deubel (2006) recommends that when using such an educational tool, teachers should also take into account how the characteristics of the game can affect children cognitively and physiologically. The most notable of the limitations of using digital-based games is the constant updating of video games. It is thought that due to this rapid and continuous change, the targeted achievements may lose their effect, and as a result, it will be difficult for researchers to evaluate the educational effect of some games (Griffiths, 2002). Teachers should also take into account the technology time available to them in the school setting. Some students may not have equal access to such educational tools if there is not enough technology to support a digital game-based learning program. In addition, whether the game contents are aimed at the targeted age group is another important factor (Deubel, 2006). In terms of parents, it is seen that there are concerns that digital games may have negative effects on the behavior of young children and cause digital game addiction (Brooks & Sjöberg, 2020a). Some researchers believe that digital games reduce children's creativity and motor skills.

Teachers and parents can take precautions against these negative situations as follows;

Games should not contain factors such as violence and discrimination, and gender inequality, and measures should be taken for this. Giving the games used in homework outside the classroom and balancing the use of digital games with other teaching activities are the factors that should be considered. In

addition, the digital games used must be compatible with the determined learning objectives.

## 6. How to Use DGBL in Early Childhood Education?

Digital game-based learning has been around longer than you might think. The Oregon Trail in 1974 is one of the first games in the world of DGBL created for educational purposes which gave children a fun way of learning about what life was like for pioneers (Juraschka, 2019). By focusing on creativity elements that should be supported at an early age, digital game-based learning games can increase students' academic success and develop 21<sup>st</sup>-century skills such as creativity, problem-solving, collaboration, and critical thinking (Bowman et al., 2015). The learning process based on digital games keeps children's curiosity about finding new ways of problem-solving by creating visual appeal, which increases children's motivation for learning (Hooshyar et al., 2020; Lin et. al., 2020). DGBL helps struggle with strengths and weaknesses and lets students practice at their own pace. DGBL platforms offer many tools for educators to take advantage of. Just need to be implemented and used effectively for positive results to take hold (Juraschka, 2019).

In Behnamia, Kamsin, Ismail, and Hayati's (2020) research, the most effective types of digital games used for children and their contents are stated as follows.

- Flashcard and alphabet games
- Games with English language skills
- Games with animals and nature
- Games with informative content about the environment and science
- Games with music content
- Games with content for STEM fields
- Memory and attention games
- Matching, sorting, classification, etc. games

Creative games, Role-playing games, Strategy games, Serious games, etc.

Studies have shown that such digital games support preschool children's development in some skills, including learning numbers and letters, foreign language skills, painting, collage, and other artistic and creative activities.

Digital game recommendations for early childhood:

**WWF Together:** This application, which presents the stories of interesting animals in the world from a different perspective, allows children to get to know and understand animals closely, and even provides content about nature and environment concepts with games such as reenacting their lives.

**Safe Child:** In this application, which has educational and entertaining content prepared for children, there are also fun and instructive content as well as intelligence games such as sudoku and chess.

**MentalUP:** This application, prepared by child development experts, offers gamified content to improve children's mental and physical skills. There are more than 120 educational intelligence games that include attention, memory, logic, visual and verbal games.

**Pet Bingo:** This application, which teaches mathematics through play, consists of content that helps preschool children learn mathematical skills and concepts.

**Wii Sports:** It includes a sports-themed game application that supports the physical development of children as hand-eye, and motor skills by turning games into physical activities, and also provides a basis for family socialization and teamwork.

**TRT Kids Underwater Explorer:** It is an educational mobile game that allows children to meet the riches of the underwater world in a fun environment.

**Virus, Newton:** It is a mobile game that offers authentic real-world contexts and 21st-century skills (Kolpfer, 2008).

## 7. Conclusions

Combining the fun side of the games with the instructional goals brings this learning model to the forefront with the developing technology. Most of the studies have focused on the effects of games on learning rather than how to apply DGBL, why, and how it will be effective (Van Eck, 2006). Children of all ages can learn through digital games. In recent years, it has been seen that it is preferable to use such games from kindergarten to 12th grade to increase children's interest in learning (Ishak, Din & Hasran, 2021). According to current research; It is seen that digital games are mostly used to support children's participation in learning processes and to increase their motivation and interest in learning. Consequently, practical experience and research are needed to explain why DGBL is interesting and effective, and how games can be integrated into the learning process (when, with whom, and under what conditions) to maximize their learning potential.

Because of the easy and fast access to technology, today's students are thought to "think and process information in a fundamentally different way than before." Teachers who are called "digital immigrants" have to adapt to the language and learning styles of students, who are now "digital natives" surrounded by technology (Prensky, 2001b).

The claim that digital games will be a promising educational tool and should be used for educational purposes in schools is accepted within the educational technology research community. Scientists and educators conclude that games tend to produce higher levels of positive emotional intelligence in students, make the learning experience more engaging, and improve engagement (Annetta, 2008). At the same time, despite the enormous potential of DGBL, because of the difficulty in identifying their relevance to the curriculum, potential benefits, and practical integration method, it is still a problem to integrate games into the curriculum of formal education (Zin, Jaafar, & Yue, 2009).

Innovation in digital games has been proven to help solve students' problems (Prensky, 2001a). It is also seen by other studies that problem-solving becomes more creative in students who are encouraged to learn based on digital games (Brunnet & Portugal, 2016). In addition, according to Hamlen (2009), as students play digital-based games, they are reinforced to develop creative solutions in problem-solving processes. In another study, it was found that students who use digital game-based learning applications are more likely to develop different ways of thinking while solving problems (Diefenthaler et al., 2017).

The results of the research show that there are some limitations in DGBL, as in every teaching method. However, it is also supported by studies that positive gains will be much more when necessary precautions are taken. Research (Juraschka, 2019) shows since the first instance of DGBL, the teaching method has evolved in both quality and content. Now, DGBL learning platforms can easily personalize learning for every student through real-time analytics that pinpoints student strengths and weaknesses.

Today, while being so far ahead of technological developments, trying to continue the classical learning methods in the learning processes of new generations is like making them float in unfamiliar water. To support the 21st century generation born into technology, to learn more actively and to their needs, it is necessary to update learning ways to the requirements of the age. In this sense, it is inevitable to benefit from contemporary learning methods that keep up with today's technology, such as DGBL, to make learning processes more enjoyable and convenient. Digital game-based learning keeps students engaged

with educational content and can improve their overall success at school (Juraschka, 2019). Digital games (video games or computer games) are positively accepted among children and teenagers. So digital games, an interactive technology within the multimedia learning environment could foster the learning process effectively and interestingly especially among young learners (Zin, Jaafar, & Yue, 2009).

Finally, based on my research I suggest that more research, especially in the field of preschool, still needs to be done on DGBL to ensure best practices in the classroom. Technology and DGBL should be used frequently by teachers in the classroom to help every child succeed in their education. At the same time, playing games to practice what's taught in class can help students gain confidence with educational content and relieve things like math anxiety.

In addition, the effect of DGBL on motivation has been a subject that is frequently emphasized in the literature, especially in secondary education. Future research should further focus on motivation to learn with DGBL in early childhood. Intrinsic and extrinsic motivation studies on this subject can be studied experimentally. For example; It is observed that the effect of DGBL on learning or motivation in subjects such as science (Hussein, Ow, Cheong, Thong & Ale Ebrahim, 2019), mathematics (Juraschka, 2019), foreign language (Pitarch, 2018), history (Zin, Jafaar, Yue, 2009). Future researchers can also work in other subject areas with an integrated perspective. In particular, studies that take into account gender and age variables can be focused on.

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