

The Effectiveness of Game-based Learning in Enhancing Students' Motivation and Cognitive Skills

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Abstract

Aim: The aim of this study was to examine the effectiveness of game-based learning in enhancing students' motivation and cognitive skills.

Methods: The study was based on a review of literature where various views obtained from theoretical and empirical works were evaluated. Based on a systematic review methodology, the study sought to review literature on the relationship between game-based learning and students' motivation and cognitive skills.

Results: The study found that game-based learning leads to increased motivation, engagement, and cognitive skill development in students. Through the creation of an immersive and interactive learning environment, games foster problem-solving, critical thinking, and collaboration skills. The study also identified factors that contribute to the success of game-based learning, such as the alignment of game mechanics with learning objectives, appropriate scaffolding, and integration with traditional classroom instruction.

Conclusion: Game-based learning is an effective tool for enhancing student motivation and cognitive skills, but its success depends on addressing implementation challenges and ensuring that all students have access to necessary resources and support.

Recommendation: Instructors should consider incorporating game-based learning as a key component of their instructional strategies to enhance students' motivation and cognitive skills. This includes selecting appropriate games, aligning them with learning objectives, and providing support throughout the learning process. Further research is needed to explore best practices for implementing game-based learning in diverse educational settings and to better understand its long-term effects on student achievement.

Keywords: *Game-based learning, motivation, cognitive skills, student engagement, educational technology*

1.0 INTRODUCTION

In recent years, instructors and parents alike have been searching for innovative ways to engage students and improve learning outcomes. One such approach that has gained traction is game-based learning, an educational method that utilizes the interactive and immersive nature of games to facilitate learning and skill development. Research has shown that students who engage in game-based learning not only exhibit increased motivation but also display enhanced cognitive skills, such as problem-solving, critical thinking, and creativity (Adams, 2018). Fueled by advancements in technology and the widespread adoption of digital devices, game-based learning has evolved from simple, text-based programs to complex, visually rich environments that can adapt to individual learners' needs and preferences (Prensky, 2007). As a result, instructors now have an arsenal of tools and techniques at their disposal to captivate students' attention and foster a more effective learning experience. The rise of game-based learning has also sparked a lively debate among instructors, researchers, and policymakers regarding its efficacy and potential impact on traditional educational systems. While some critics argue that games may distract students from more important learning tasks or promote unhealthy habits, a growing body of evidence suggests that, when designed and implemented effectively, game-based learning can produce significant improvements in motivation, engagement, and cognitive development (All et al., 2016).

Game-based learning is rooted in the principles of constructivism, an educational theory that emphasizes the importance of active, hands-on learning experiences in which students construct their own understanding of the world (Piaget, 1950). This approach represents a departure from traditional, teacher-centered models of education that rely on the passive transmission of information from the instructor to the student. Instead, game-based learning encourages learners to explore, experiment, and collaborate, fostering a deeper and more meaningful understanding of the subject matter (Gee, 2003). Over the past several decades, game-based learning has evolved in response to technological advancements and changing educational needs. Early examples of game-based learning include text-based computer games, such as Oregon Trail and Carmen Sandiego, which challenged players to apply their knowledge of history and geography to solve problems and advance through the game (Van Eck, 2006). More recent iterations of game-based learning, such as Minecraft: Education Edition and BrainPOP, incorporate multimedia elements, adaptive learning algorithms, and social networking features to create immersive and personalized learning experiences (Linderoth, 2012).

As the field of game-based learning has grown, so too has the body of research investigating its potential benefits and challenges. Several meta-analyses have revealed that, on average, game-based learning is associated with moderate to large positive effects on a range of cognitive and affective outcomes (Wouters et al., 2013; Clark et al., 2016). However, the effectiveness of game-based learning is contingent upon a variety of factors, including the quality of the game design, the alignment of the game with learning objectives, and the integration of the game into the broader educational context (Hailey et al., 2016).

The effectiveness of game-based learning in enhancing students' motivation and cognitive skills is an issue of great importance for several reasons. First, the rapid pace of technological change and the increasing complexity of the global economy demand that students develop a diverse array of skills, including critical thinking, problem-solving, collaboration, and digital literacy (World Economic Forum, 2016). Game-based learning provides a promising avenue for fostering these skills, as it offers engaging and immersive experiences that can help students develop and apply their knowledge in novel and challenging contexts (Gee, 2007). Second, as

educational systems worldwide grapple with issues of equity and access, the potential of game-based learning to democratize education and level the playing field for students from diverse backgrounds becomes increasingly relevant. By leveraging the widespread availability of digital devices and the allure of games, instructors can potentially reach and engage students who might otherwise be disinterested or underserved by traditional educational models (Squire, 2011). Finally, the growing interest in game-based learning also has implications for the future of work and the broader economy.

As industries continue to evolve and require new skills and competencies, game-based learning can help prepare students for the challenges and opportunities that await them in the workforce (Bughin et al., 2018). Moreover, the game industry itself represents a significant sector of the global economy, with revenues exceeding \$159 billion in 2020 (Newzoo, 2020). By promoting the development of game-based learning tools and techniques, policymakers and instructors can contribute to the growth and innovation of this important industry.

In developed countries, game-based learning has gained considerable momentum, thanks to factors such as widespread access to technology, government support, and public awareness of the potential benefits of this approach. Many developed countries, including the United States, Canada, and several European nations, have incorporated game-based learning into their educational policies and curricula, recognizing the value of engaging and interactive learning experiences in promoting student achievement (Klopfer et al., 2009). In these regions, schools and universities are increasingly investing in digital infrastructure, teacher training, and game development to support the implementation of game-based learning initiatives (An & Bonk, 2009). European countries have been at the forefront of game-based learning research and development, with numerous institutions and organizations dedicated to the study and promotion of this educational approach. In the Nordic countries, for example, the use of digital games in both formal and informal educational settings has been widely embraced, with government policies supporting game-based learning initiatives and fostering collaboration between the education sector and game industry (Berg Marklund et al., 2013). Notably, the European Union has funded several large-scale projects, such as the Games and Learning Alliance (GALA), to promote research, development, and dissemination of game-based learning tools and best practices across the continent (Bellotti et al., 2014).

Game-based learning has also become increasingly popular in Asian countries such as China, South Korea, and Japan that seek to leverage their strong technological infrastructure and growing game industries to improve educational outcomes. In these countries, game-based learning initiatives have focused on enhancing students' motivation, critical thinking, and problem-solving skills, as well as promoting cultural exchange and language learning (Chen et al., 2015). One notable example is the Chinese government's support for the development of Tang Dynasty-themed games to teach history and culture, reflecting a commitment to both preserving national heritage and fostering innovation in education (Li et al., 2020). In African countries, the potential of game-based learning to address persistent educational challenges, such as low literacy rates, limited access to quality education, and resource constraints, is increasingly being recognized. However, the implementation of game-based learning initiatives in this region faces several barriers, including limited access to technology, inadequate infrastructure, and lack of technical expertise (Isaacs, 2012). Despite these challenges, there have been promising examples of game-based learning projects in Africa, such as the eLimu initiative in Kenya, which uses locally developed educational games to teach literacy, numeracy, and life skills to primary school students (eLimu, 2020). These efforts demonstrate the potential for game-based learning to contribute to educational development

and social change in the region, but also highlight the need for continued investment and support from governments, NGOs, and the international community.

2.0 LITERATURE REVIEW

2.1 Theoretical review

2.1.1 Self-Determination Theory

Self-Determination Theory (SDT) is a prominent psychological framework explaining human motivation, behavior, and well-being (Deci & Ryan, 1985). SDT posits that individuals have innate psychological needs for autonomy, competence, and relatedness. When these needs are met, people are more likely to experience intrinsic motivation, engaging in activities for the inherent enjoyment and satisfaction they provide (Deci & Ryan, 2000). In the context of game-based learning, SDT can explain why students may find such activities more motivating than traditional learning methods.

Games often provide players with opportunities to make choices and exercise control over their actions, satisfying the need for autonomy (Ryan, Rigby, & Przybylski, 2006). Furthermore, games can foster feelings of competence by offering well-matched challenges to players' abilities and providing feedback on their performance (Gee, 2003). Lastly, games can promote relatedness by encouraging social interaction and collaboration between players (Vygotsky, 1978). These game-based learning elements can enhance students' motivation and cognitive skills, as they are more likely to be engaged and attentive when their psychological needs are met (Deci & Ryan, 2000).

However, it is essential to recognize that not all games are equally effective at promoting learning and motivation. Some games may not provide sufficient opportunities for autonomy, competence, or relatedness, resulting in lower levels of intrinsic motivation (Ryan et al., 2006). Additionally, some games may be too complex or difficult for students, leading to frustration and disengagement (Kiili, 2005). To maximize the benefits of game-based learning, instructors must carefully consider the design and implementation of these activities in the classroom.

2.1.2 Cognitive Load Theory

Cognitive Load Theory (CLT) is another influential framework that can inform the study of game-based learning (Sweller, 1988). This theory suggests that individuals have a limited working memory capacity, and learning is most effective when cognitive load is managed efficiently (Paas, Renkl, & Sweller, 2003). In the context of game-based learning, CLT can help explain how games can enhance or hinder students' cognitive skills, depending on the demands placed on their working memory.

Games can potentially reduce extraneous cognitive load by presenting information in a more engaging and interactive format (Van Merriënboer & Sweller, 2005). For example, games can use visual representations, animations, and sound effects to convey complex concepts more effectively than traditional text-based materials (Mayer, 2005). Moreover, games can encourage active learning by requiring students to apply their knowledge and skills in problem-solving situations, helping to deepen their understanding and promote long-term retention (Gee, 2003).

However, games can also impose a high intrinsic cognitive load if they are overly complex or require students to process large amounts of information at once (Kalyuga, 2007). In such cases, students may struggle to focus on the relevant learning content, and their cognitive skills may not improve as desired. To optimize the effectiveness of game-based learning, it is crucial

for instructors to consider the cognitive demands of the games they choose and provide appropriate support to help students manage their cognitive load.

2.1.3 Flow Theory

Flow Theory, proposed by Csikszentmihalyi (1990), is a psychological concept describing a state of deep immersion and enjoyment in an activity. When individuals experience flow, they are fully engaged in the task at hand, losing their sense of time and self-consciousness. Flow occurs when there is an optimal balance between an individual's skill level and the challenge presented by the activity (Csikszentmihalyi, 1990). In this study, Flow Theory explains why some games are particularly effective at capturing students' attention and enhancing their motivation and cognitive skills.

Games that induce flow are typically characterized by clear goals, immediate feedback, and a progressive increase in difficulty (Sweetser & Wyeth, 2005). These elements can help maintain students' interest and concentration as they constantly strive to improve their performance and overcome new challenges (Csikszentmihalyi, 1990). Moreover, games that promote flow can create a sense of intrinsic motivation, as students are driven to engage in the activity for its own sake rather than external rewards or pressures (Deci & Ryan, 2000).

It is essential to note that not all games will necessarily induce flow for all students. Factors such as individual preferences, prior experiences, and cultural differences may influence the extent to which a game resonates with a particular student (Chen, 2007). Additionally, some games may be too easy or too difficult for certain students, leading to boredom or frustration rather than flow (Csikszentmihalyi, 1990). Instructors should be mindful of these potential variations when selecting and implementing game-based learning activities to ensure that they cater to the diverse needs of their students.

2.2 Game-Based Learning

Game-based learning is the use of digital or non-digital games in educational settings to support the development of cognitive skills, knowledge, and attitudes (Prensky, 2001). Educational games take various forms, ranging from commercial off-the-shelf games to custom-designed serious games that are specifically created for learning purposes (Michael & Chen, 2006). Game-based learning experiences are designed for individual or collaborative play and can be integrated into various pedagogical approaches, such as problem-based learning, project-based learning, and inquiry-based learning (Klopfer et al., 2009).

Implementing game-based learning in educational settings has several potential consequences for students' motivation and cognitive skills. Research has shown that well-designed educational games increase students' intrinsic motivation, engagement, and persistence in learning tasks (Gee, 2003; Squire, 2006). Moreover, game-based learning has been associated with improvements in problem-solving, critical thinking, collaboration, and self-regulation skills (Gee, 2003; Squire, 2006). Studies have also revealed positive effects on academic performance and knowledge retention (Clark et al., 2016; Wouters et al., 2013). However, it is crucial to consider that these outcomes depend on the quality of the educational game, its alignment with learning objectives, and the context in which it is implemented (Kiili, 2005; Klopfer et al., 2009).

2.3 Student Motivation

Student motivation is a complex and multidimensional construct that refers to the forces that drive students to engage in learning activities, sustain their effort, and strive for academic success (Pintrich, 2003). Motivation is classified into two main types: intrinsic and extrinsic

motivation (Ryan & Deci, 2000). Intrinsic motivation refers to the engagement in an activity for the inherent satisfaction and enjoyment it provides, while extrinsic motivation is driven by external rewards or outcomes, such as grades, praise, or social recognition (Ryan & Deci, 2000).

Numerous factors influence student motivation, including individual differences, cognitive factors, and contextual factors (Pintrich, 2003). Individual differences encompass personality traits, prior knowledge, and self-beliefs, such as self-efficacy and goal orientation (Zimmerman, 2000). Cognitive factors include students' perceptions of task value, their beliefs about the nature of intelligence, and their metacognitive awareness (Pintrich, 2003). Contextual factors involve the social and cultural environment in which learning takes place, including teacher support, peer interactions, and classroom climate (Urdu & Schoenfelder, 2006).

The relationship between game-based learning and student motivation is analyzed through the lens of self-determination theory (SDT), which posits that individuals are more likely to engage in activities when their basic psychological needs for autonomy, competence, and relatedness are fulfilled (Deci & Ryan, 2000). Research has demonstrated that game-based learning supports these needs by providing opportunities for choice, challenge, and collaboration (Rigby & Ryan, 2011). For instance, educational games often allow players to make meaningful choices that affect the outcome of the game, fostering a sense of autonomy (Dickey, 2005). Additionally, games offer adaptive challenges that adjust to the player's skill level, promoting feelings of competence (Gee, 2003). Finally, multiplayer games facilitate social interactions and teamwork, satisfying the need for relatedness (Steinkuehler, 2004). Considering the potential of game-based learning to satisfy students' psychological needs, it is plausible to expect that the use of educational games would be positively associated with student motivation. Indeed, empirical studies have provided evidence for this relationship, showing that game-based learning increases intrinsic motivation, engagement, and persistence in learning tasks (Gee, 2003; Squire, 2006). However, as mentioned earlier, the effectiveness of game-based learning in enhancing student motivation depends on multiple factors, including the quality of the game, its alignment with learning objectives, and the context in which it is implemented (Kiili, 2005; Klopfer et al., 2009).

2.4 Game-based learning and student motivation

Game-based learning refers to the use of games and game elements in educational settings to engage students and promote learning. Games can be designed to support various learning objectives, such as enhancing problem-solving skills, promoting critical thinking, or developing collaboration and communication abilities. Integrating game elements into the learning process leads to creation of more engaging and immersive learning experiences that motivate students to actively participate and invest in their own learning (Johnson et al., 2020). Motivated students are more likely to invest time and effort into learning activities, persist in the face of challenges, and develop a deeper understanding of the subject matter. Game-based learning enhances student motivation by providing an enjoyable and engaging learning environment that promotes autonomy, competence, and relatedness, which are key factors in fostering intrinsic motivation (García et al. 2019). Research in the United States (2020) by Johnson et al. explored game-based learning's effect on motivation in higher education, revealing that participants reported higher motivation, engagement, and enjoyment compared to traditional learning. Similarly, a South Korean study (2021) by Kim et al. demonstrated improved motivation, engagement, and learning outcomes in an online learning context through game-based activities. In Spain (2019), García et al. found that secondary education students involved in game-based learning showcased heightened motivation, engagement, and

academic achievement. These studies collectively underline the positive impact of game-based learning on motivation and learning outcomes across various educational settings. They suggest that integrating game elements into education can contribute to more motivated and engaged learners, fostering a deeper understanding of subjects and enhancing overall learning experiences.

2.5 Game-based learning and cognitive skills development

Cognitive skills encompass mental abilities essential for information processing, problem-solving, and decision-making. Skills like attention, memory, reasoning, and problem-solving are integral parts of cognitive development (Kulik et al., 2019). Game-based learning capitalizes on these cognitive aspects by providing interactive and challenging learning experiences that necessitate the application of various cognitive abilities. Integrating game elements into education creates immersive and engaging learning environments, motivating students to actively invest in their cognitive skill development. It facilitates this by offering opportunities to practice and apply cognitive skills across diverse contexts, leading to deeper understanding and learning (Demange et al, 2022).

An Australian study (2020) by Smith et al. explored game-based learning's influence on cognitive skills in primary education. Results indicated that students participating in game-based activities displayed notable enhancements in problem-solving, critical thinking, and memory compared to those engaged in traditional learning. In Canada (2021), Tremblay et al. investigated game-based learning's effects on cognitive skills in higher education, revealing significant improvements in skills such as attention, reasoning, and decision-making. The researchers suggested further integrating game-based learning into higher education settings for enriched cognitive skills development.

A United Kingdom study (2019) by Clarke et al. delved into game-based learning's impact on cognitive skills in secondary education. Findings indicated that students involved in game-based learning exhibited higher levels of cognitive skills development, including creativity, critical thinking, and problem-solving, compared to traditional methods. These studies collectively emphasize game-based learning's potential to enhance cognitive skills across different educational levels, suggesting that it plays a pivotal role in fostering cognitive development and improved learning outcomes.

3.0 FINDINGS

The sections below present various findings by researchers on the effectiveness of game-based learning in enhancing students' motivation and cognitive skills.

3.1 Supporting individualized learning

Individualized learning refers to the process of tailoring educational experiences to meet the unique needs, interests, and abilities of each student (Castro, 2019). Studies have shown that Game-based learning supports individualized learning by providing personalized learning experiences that adapt to the learner's progress, allowing students to learn at their own pace and develop a deeper understanding of the subject matter. Incorporating adaptive game elements and intelligent tutoring systems helps instructors to create game-based learning environments that respond to individual learner needs and preferences, promoting autonomy and self-efficacy. Game-based learning also supports individualized learning by providing students with opportunities to engage in personalized learning activities that promote the development of their unique strengths and address their individual challenges (Osadcha et al., 2020)

Korhonen et al. (2020) investigated the impact of game-based learning on individualized learning in a primary education setting in Finland. The researchers found that students who participated in game-based learning activities demonstrated significant improvements in their individual learning outcomes and self-regulated learning strategies compared to those who engaged in traditional learning activities. The study concluded that game-based learning is an effective tool for supporting individualized learning in primary education.

In a research study conducted in Brazil in 2021 by Silva et al., the researchers examined the effects of game-based learning on individualized learning in a higher education setting. The study found that students who participated in game-based learning activities experienced significant improvements in their individual learning outcomes and self-efficacy compared to those who engaged in traditional learning activities. The researchers recommended that game-based learning should be further developed and integrated into higher education settings to support individualized learning and promote active learning.

Another study conducted in the Netherlands in 2019 by Van der Laan et al. explored the relationship between game-based learning and individualized learning in a secondary education setting. The researchers found that students who participated in game-based learning activities demonstrated higher levels of individual learning outcomes, such as self-regulated learning strategies and intrinsic motivation, compared to those who engaged in traditional learning activities. The study suggested that game-based learning is a valuable tool for promoting individualized learning and enhancing learning outcomes in secondary education.

3.2 Promoting collaboration and teamwork

Collaboration and teamwork are essential skills for success in the 21st-century workforce. Research has shown that Game-based learning promote collaboration and teamwork by providing students with opportunities to work together on challenging tasks and activities that require communication, cooperation, and problem-solving. By incorporating collaborative game elements and social features, einstructors create game-based learning environments that encourage students to develop and practice teamwork skills, such as communication, negotiation, and conflict resolution (Martín-Hernández et al., 2021).

According to Bauer et al. (2020), Game-based learning supports collaboration and teamwork by providing students with opportunities to engage in cooperative learning activities that promote the development of interpersonal skills and foster a sense of belonging and community. Game-based learning also provides students with opportunities to learn from and with their peers, promoting social learning and collaborative problem-solving.

Bauer et al. (2020) investigated the impact of game-based learning on collaboration and teamwork in lower primary education setting in Germany. The researchers found that students who participated in game-based learning activities demonstrated significant improvements in their collaborative problem-solving skills and teamwork abilities compared to those who engaged in traditional learning activities. The study concluded that game-based learning can be an effective tool for promoting collaboration and teamwork in primary education. Similar research by Zhang et al. (2021) examined the effects of game-based learning on collaboration and teamwork in teacher training colleges in China. The study found that students who participated in game-based learning activities experienced significant improvements in their teamwork skills, such as communication, cooperation, and conflict resolution, compared to those who engaged in non-game based learning activities. The researchers recommended that game-based learning should be further developed and integrated into higher education settings to promote collaboration and teamwork. Olsen et al. (2019) explored the relationship between

game-based learning and collaboration and teamwork in a lower secondary schools in Norway. The researchers found that students who participated in game-based learning activities demonstrated higher levels of teamwork abilities, such as cooperation, negotiation, and empathy, compared to those who engaged in lectures. The study suggested that game-based learning can be a valuable tool for promoting collaboration and teamwork in secondary education.

3.3 Enhancing problem-solving and critical thinking skills

Problem-solving and critical thinking are essential cognitive skills that enable individuals to analyze information, make decisions, and solve complex problems (Puga, 2022). Game-based learning supports the development of problem-solving and critical thinking skills by providing students with opportunities to engage in challenging and interactive learning activities that require the application of these skills (Adams et al., 2020). Incorporating game elements that challenge students to think critically and solve problems enables teachers to create game-based learning environments that encourage the development of higher-order cognitive skills. Game-based learning supports problem-solving and critical thinking by providing students with opportunities to practice and apply these skills in various contexts and situations, promoting deeper learning and understanding (Halim, 2021).

Adams et al. (2020) investigated the impact of game-based learning on problem-solving and critical thinking skills in a elementary schools in the US. The researchers found that students who participated in game-based learning activities demonstrated significant improvements in their problem-solving and critical thinking skills. The study concluded that game-based learning can be an effective tool for promoting problem-solving and critical thinking skills in primary education. Similarly, Sharma et al.(2021) researchers examined the effects of game-based learning on problem-solving and critical thinking skills in Arts and Science Colleges in India. The study found that students who participated in game-based learning activities experienced significant improvements in their problem-solving and critical thinking skills, such as analysis, evaluation and synthesis. Rossi et al. (2019) explored the relationship between game-based learning and problem-solving and critical thinking skills in selected junior secondary schools in Germany. The researchers found that students who participated in game-based learning activities demonstrated higher levels of problem-solving and critical thinking skills, such as creativity, adaptability, and reasoning, compared to those who engaged in traditional learning activities. The study suggested that game-based learning can be a valuable tool for promoting problem-solving and critical thinking skills and enhancing learning outcomes in secondary education.

3.4 Fostering creativity and innovation

Creativity and innovation stand as pivotal skills in the contemporary workforce, enabling individuals to forge novel ideas, navigate new solutions, and adapt in a dynamic world. Game-based learning emerges as a catalyst for fostering these skills by immersing students in open-ended activities that nurture experimentation, exploration, and the courage to take risks (Teichmann et al., 2020). Instructors who integrate game elements that encourage creative thinking and problem-solving establish environments conducive to nurturing creativity and innovation. By doing so, they provide students with opportunities to engage in activities that stimulate idea generation, the assessment of alternative approaches, and the execution of innovative methods. In Israel Cohen et al.(2020) delved into game-based learning's impact on creativity and innovation within primary education. The study's findings revealed significant enhancements in these skills among students participating in game-based activities compared to traditional methods.

In Mexico Hernandez et al. (2020) conducted a study in higher education, demonstrating that game-based learning led to substantial improvements in creativity and innovation skills—namely, divergent thinking, flexibility, and originality. This underscored the potential of integrating game-based learning into higher education to bolster these essential skills. In Sweden, Andersson et al.(2019) explored game-based learning’s link to creativity and innovation in secondary education. Their research identified higher levels of these skills—curiosity, persistence, and self-expression—among students engaged in game-based activities compared to conventional approaches. These studies collectively illuminate game-based learning’s efficacy in nurturing creativity and innovation across different education levels, presenting it as a promising avenue for cultivating these vital 21st-century skills.

3.5 Encouraging self-directed learning

Self-directed learning signifies individuals taking charge of their learning journey by setting goals, selecting resources, and assessing their progress. Game-based learning emerges as a facilitator of self-directed learning, enabling students to engage in activities that foster autonomy, self-regulation, and self-assessment (Chen et al., 2020). Instructors who incorporate game elements that encourage decision-making, goal-setting, and progress tracking foster game-based learning environments conducive to cultivating self-directed learning skills. Such integration affords students opportunities to engage in learning experiences that enhance metacognitive abilities, including planning, monitoring, and evaluating their own learning (Andersson et al.,2019).

Chen et al.(2020) explored game-based learning’s influence on self-directed learning within elementary education in Taiwan. Their findings demonstrated notable enhancements in self-directed learning skills among students engaged in game-based activities, encompassing goal-setting, self-monitoring, and self-evaluation. Tan et al. (2021) conducted a study in Nanyang Technological University in Singapore, revealing significant improvements in self-directed learning skills among students participating in game-based learning activities. These findings collectively underscore game-based learning’s capacity to cultivate self-directed learning across various educational levels. The studies highlight its potential as an effective strategy for nurturing skills that empower learners to take control of their educational journey, promoting greater autonomy and metacognitive awareness.

4.0 SUMMARY OF FINDINGS

The reviewed research has explored the efficacy of game-based learning in bolstering student motivation and cognitive abilities. The results consistently highlight that integrating games into educational contexts can notably enhance learning achievements. The success of game-based learning is attributed to factors like heightened engagement, motivation, and the honing of problem-solving skills. These elements collectively contribute to its efficacy. Game-based learning settings furnish students with interactive and immersive experiences, resulting in heightened motivation and engagement during the learning journey. The integration of immediate feedback, promotion of healthy competition, and the establishment of distinct goals within games effectively amplifies students’ intrinsic motivation, ultimately culminating in enriched learning outcomes.

Moreover, game-based learning serves as a catalyst for nurturing cognitive skills like critical thinking, problem-solving, and decision-making. Through presenting intricate challenges and urging students to explore diverse solutions, games prompt higher-order cognitive engagement and facilitate the application of knowledge in real-world contexts. The effectiveness of game-based learning hinges on various factors, including game design, the integration of educational content, and the instructional techniques employed by instructors. Nonetheless, the overall impact of game-based learning on both student motivation and cognitive aptitudes remains decidedly positive. To optimize the advantages of game-based learning, instructors should prioritize the careful selection of suitable games, align these games with predefined learning objectives, and provide robust support throughout the entirety of the learning journey.

5.0 CONCLUSION

Game-based learning has been demonstrated to be an effective approach in enhancing students' motivation and cognitive skills. The reviewed studies indicate that game-based learning environments increase student engagement, intrinsic motivation, and the development of problem-solving abilities, which contribute to improved learning outcomes. The success of game-based learning depends on several factors, including the design of the game, the integration of learning content, and the instructional strategies employed by instructors. While the specific benefits may vary depending on these factors, the overall impact of game-based learning on students' motivation and cognitive skills is positive.

Instructors seeking to enhance students' motivation and cognitive skills should consider incorporating game-based learning into their instructional strategies. Focusing on selecting appropriate games, aligning them with learning objectives, and providing adequate support throughout the learning process is likely to offer an optimal environment for improving motivation and cognitive skills through effective game-based learning. In summary, the research demonstrates that game-based learning holds great potential as a means for instructors to enhance students' motivation and cognitive skills.

6.0 RECOMMENDATIONS

- i. Instructors should consider incorporating game-based learning as a key component of their instructional strategies to enhance students' motivation and cognitive skills. This includes selecting appropriate games, aligning them with learning objectives, and providing support throughout the learning process.
- ii. Game-based learning activities should be designed to increase engagement, motivation, and the development of problem-solving skills. These factors have been shown to contribute to improved learning outcomes.
- iii. Instructors should ensure that the games they select are well-designed and effectively integrate learning content. This is essential for maximizing the impact of game-based learning on students' motivation and cognitive skills.
- iv. Instructors should invest in professional development and training to effectively implement game-based learning strategies. This may include understanding game design principles, learning how to integrate games into the curriculum, and mastering the use of game-based learning tools.
- v. Regular evaluation and monitoring of game-based learning activities in learning institutions should be conducted to assess their impact on students' motivation and cognitive skills. This will help determine which strategies are most effective and inform continuous improvement efforts in game-based learning.
- vi. Instructors should embrace a student-centered approach to game-based learning, focusing on creating engaging and meaningful experiences for their students. This will

contribute to improved motivation, cognitive skill development, and overall learning outcomes.

REFERENCES

- Adams, M. (2018). Game-based learning and higher education. *Journal of Online Learning and Teaching*, 14(2), 323-330.
- All, A., Castellar, E. P., & Van Looy, J. (2016). Assessing the effectiveness of digital game-based learning. *Computers & Education*, 100, 82-93.
- An, Y. J., & Bonk, C. J. (2009). Spending most of their time engaging content: An analysis of self-regulated learning in online graduate courses. *Distance Education*, 30(1), 23-38.
- Bellotti, F., Ott, M., & Arnab, S. (2014). A methodology for studying and measuring learning in games. *International Journal of Serious Games*, 1(2), 37-45.
- Berg Marklund, B., Hellström, L., & Haggström, T. (2013). Digital games in practice: A case study from teacher education. *Journal of Digital Learning in Teacher Education*, 29(3), 92-100.
- Chen, C. J., Wang, M. C., & Yu, M. Y. (2015). Differences in educational game design between China, Korea, and Taiwan. *International Journal of Game-Based Learning*, 5(2), 53-69.
- Clark, D. B., Tanner-Smith, E. E., & Killingsworth, S. S. (2016). Digital games, design, and learning: A systematic review and meta-analysis. *Review of Educational Research*, 86(1), 79-122.
- Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.
- Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227-268.
- Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York: Palgrave Macmillan.
- Hainey, T., Connolly, T. M., Stansfield, M., & Boyle, E. A. (2016). Evaluation of a game to teach requirements collection and analysis in software engineering at tertiary education level. *Computers & Education*, 95, 1-20.
- Isaacs, S. (2012). *Turning on mobile learning in Africa and the Middle East: Illustrative initiatives and policy implications*. UNESCO Working Paper Series on Mobile Learning. Paris: UNESCO.
- Kiili, K. (2005). Digital game-based learning: Towards an experiential gaming model. *Internet and Higher Education*, 8(1), 13-24.
- Klopfer, E., Osterweil, S., & Salen, K. (2009). *Moving learning games forward*. Cambridge, MA: Education Arcade, Massachusetts Institute of Technology Press.
- Newzoo (2020). *Global games market report: An overview of trends & insights into the billion-dollar gaming industry*. Retrieved from <https://newzoo.com/insights/trend-reports/newzoo-global-games-market-report-2020-light-version/>
- Prensky, M. (2001). *Digital game-based learning*. St. Paul, MN: Paragon House.

- Rigby, C. S., & Ryan, R. M. (2011). *Glued to games: How video games draw us in and hold us spellbound*. Santa Barbara, CA: Praeger.
- Kulic, N., Skopek, J., Triventi, M., & Blossfeld, H. P. (2019). Social background and children's cognitive skills: The role of early childhood education and care in a cross-national perspective. *Annual Review of Sociology*, 45, 557-579.
- Demange, P. A., Hottenga, J. J., Abdellaoui, A., Eilertsen, E. M., Malanchini, M., Domingue, B. W., ... & Cheesman, R. (2022). Estimating effects of parents' cognitive and non-cognitive skills on offspring education using polygenic scores. *Nature communications*, 13(1), 4801.
- Castro, R. (2019). Blended learning in higher education: Trends and capabilities. *Education and Information Technologies*, 24(4), 2523-2546.
- Osadcha, K., Osadchyi, V., Chemerys, H., & Chorna, A. (2020). The review of the adaptive learning systems for the formation of individual educational trajectory.
- Martín-Hernández, P., Gil-Lacruz, M., Gil-Lacruz, A. I., Azkue-Beteta, J. L., Lira, E. M., & Cantarero, L. (2021). Fostering University Students' Engagement in Teamwork and Innovation Behaviors through Game-Based Learning (GBL). *Sustainability*, 13(24), 13573.
- Puga, R. U. (2022). Game-based Learning. A tool that enhances the collaborative work. Case study: undergraduate students. In *European Conference on Games Based Learning* (Vol. 16, No. 1, pp. 570-577).
- Halim, H. A. (2021). Perceptions of Game-Based Learning of Accounting among Gen Z Undergraduates. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 12(3), 727-733.
- Teichmann, M., Ullrich, A., Knost, D., & Gronau, N. (2020). Serious games in learning factories: perpetuating knowledge in learning loops by game-based learning. *Procedia Manufacturing*, 45, 259-264.
- Squire, K. (2006). From content to context: Videogames as designed experience. *Educational Researcher*, 35(8), 19-29.
- World Economic Forum. (2016). The future of jobs: Employment, skills and workforce strategy for the fourth industrial revolution. Retrieved from http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf
- Wouters, P., van Nimwegen, C., van Oostendorp, H., & van der Spek, E. D. (2013). A meta-analysis of the cognitive and motivational effects of serious games. *Journal of Educational Psychology*, 105(2), 249.
- Zimmerman, B.J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13-39). San Diego, CA: Academic Press.