




Effectiveness of Digital Game Based Learning Strategy in Higher Educational Perspectives

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Abstract

Digital game-based learning strategy is now widely used in various fields such as education, marketing and advertising. This learning strategy has attracted great attention from scholars and practitioners in recent years due to its effectiveness in various educational fields. As more research studies favored the constructive impact of games on the learning process, more and more investigators are dedicated to developing digital educational games to enhance learning skills for 21st century requirements. The objectives of the current investigation were: to present a comprehensive and systematic review of the literature of previous studies on the effectiveness of digital game-based learning strategy in a higher educational context; to report the role of various adult learning theories in digital game-based learning strategy; to highlight some barriers and their solutions in digital game-based learning strategy. A total of 20 previous studies on digital game-based learning strategy in higher educational perspectives published from 2008-2021 were selected by inclusion and exclusion criteria for conducting this investigation. The results of the current investigation revealed that digital game-based learning strategy has deep effects on the learning skills of the learners in higher educational perspectives. The digital game-based learning strategy is a better option for the improvement of engagement of learners towards learning and critical thinking skills.

Keywords: Digital game based learning, Effectiveness, Engagement, Higher education.

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Contribution of this paper to the literature

This review article was conducted to describe the effectiveness of game-based learning strategy in a higher educational perspective. This study provided the evidence that game-based learning strategy is an effective learning strategy in higher education.

1. Introduction

Students born in the 21st Century are called digital natives since they grow up with digital technology (Prensky, 2001). New and advanced technologies have changed the learning style of students. Lorenzo-Alvarez, Rudolphi-Solero, Ruiz-Gomez, and Sendra-Portero (2020) found that by using these technologies, students appeared to be more confident, autonomous and creative. Digital gaming is based on activating prior knowledge and experience and giving instant feedback. This method can be used to solve real-life problems (Hamari et al., 2016). Digital game based learning is a modern learning strategy in which students learn in a joyful environment. Digital platform-based games motivate students and help them learn with full focus and participation. This learning strategy improves students' ability to experience, create, communicate and visualize by accepting play challenges (Haruna et al., 2018). Digital games encounter the real requirements and interests of adults and has become a widespread computer-based activity by providing new means of communication (Moylan, Burgess, Figley, & Bernstein, 2015; Rugube & Govender, 2022). Learners like to work when it's not forced on them (Prensky, 2003). According to Von Wangenheim and Shull (2009) the true benefit of digital games is that they allow individuals to recreate themselves in new realms of learning. Digital educational games enable the learners to act as a main role in learning, making the learning easier, more enjoyable and efficient. The difference between traditional learning and digital game-based learning strategies is illustrated in Table 1.

Table 1. Difference between digital game-based and traditional learning strategies

Factor	Digital Game Based	Traditional
Cost-Effective	Yes	Yes
Low physical risk and liability	Yes	Yes
Assessments that enable comparisons between students	Yes	Yes
Highly engaging	Yes	No
Learning pace tailored to individual students	Yes	No
Instant feedback on student mistakes	Yes	No
It is easy for learners to shift their learning to a real-world environment.	Yes	No
Active participation of the student	Yes	No

In digital game process, students have to face many challenges by solving a complex systematic and well-designed problem and competing with their peers. This type of competition improves students' enthusiasm and learning ability and they can easily achieve their goals (Prensky, 2001). As information and communication technologies are developing rapidly, learning based on digital games has also become popular and transferred to mobile technology (Ciampa, 2014). Nousiainen, Kangas, Rikala, and Vesisenaho (2018) discussed how the learning process based on digital games is integrated with curriculum development, teachers' teaching skills, and student participation in digital game-based activities. The structural framework of digital game-based learning strategy is shown in Figure 1.

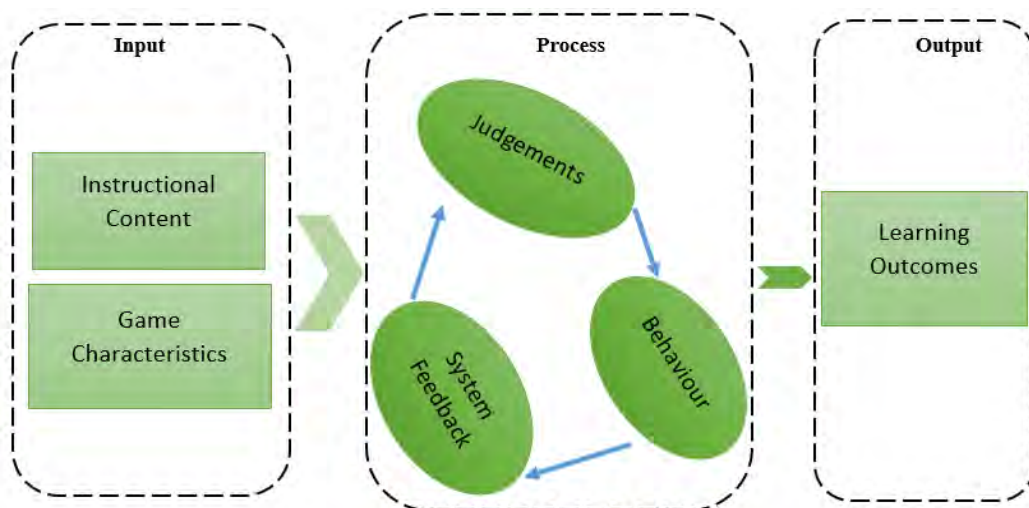


Figure 1. Structural framework of digital game-based learning strategy.

The researchers stated digital game based learning strategy is enjoyable and immersive activity in which objectives are achieved according to the defines rules (Stenros, 2017). Chang and Yeh (2021) suggested that integration of digital games in educational goals and objectives not only inspire the learners but also provides them with an interactive and innovative learning environment. Kikot, Costa, Fernandes, and Águas (2014) pointed out that use of digital games is a natural type of learning. Learners play voice games to speak, learn by collaboration and enhance thinking while playing. Burguillo (2010) proposed a framework to implement digital game-based learning to motivate students and improve their academic achievements. Holbrey (2020) introduced the classroom usage of digital game-based educational learning strategy in undergraduate courses and reported that use of digital game-based learning strategy led to a change in traditional methods of learning. The instructor-centered learning strategy is transformed into a learner-centered learning strategy by digital games, in which learners are more dynamic and involved.

1.1. Purpose of the Study

Present age learning strategies and requirements have been changed from traditional to computer and mobile based (Hosseini, Hartt, & Mostafapour, 2019). Now the traditional learning strategies don't fulfill current society needs (Lorenzo-Alvarez et al., 2020). Various modern learning strategies have been developed and used at different educational levels and under various learning environments (Noroozi, Dehghanzadeh, & Talaei, 2020). The digital game-based strategy is one of the modern learning strategies that are being used in different educational levels from primary to higher classes. A lot of research has been done into the effectiveness of digital game-based learning strategy in higher educational (Gris & Bengtson, 2021; Romero & Kalmpourtzis, 2020). However, the results of the previous studies on the effectiveness of digital game-based learning strategy in higher educational perspectives are ambiguous and need to explain more. The objectives of the current investigation were: (i) to present a comprehensive and systematic review of the literature of previous studies published from 2008-2021 on the effectiveness of digital game-based learning strategy in higher educational perspectives; (ii) to report the role of various learning theories in digital game-based learning process; (iii) to highlight some barriers and their solutions in digital game-based learning strategy. This study may provide evidence for the effectiveness of digital game-based learning strategy in higher educational perspectives.

2. Methodology

2.1. Article Selection Process

The main objective of this review study was to reveal the effectiveness of game-based learning strategy in the higher educational context between 2008 to 2021 years. For this purpose, the Web of Science database was selected to collect the review of related articles. In the Web of Science interface, "Effectiveness", "digital game-based learning" and "higher education" terms were entered as the main contents of the search. Moreover, the Social Science Citation Index (SSCI), Science Citation Index- Expanded (SCI-Expanded), Emerging Sources Citation Index (ESCI) and Arts & Humanities Citation Index (A&HCI) were also selected as the main indexes for the search. The main reason for using all indexes listing articles was to explore a variety of research and review papers that are related with the effectiveness of game-based strategy at the higher educational level. Furthermore, "custom year range from 2008 to June 2021" was determined as the time limit for the current study. The advanced search was done from 5th to 10th august, 2021. Based on the initial results, 151 papers were discovered. The specific inclusion criteria were applied to limit articles for systematic and comprehensive review on the effectiveness of game-based strategy in the higher educational context. The first criterion was to use "educational research" as a Web of Science category. "Only items" such as papers and PDF documents were the other inclusion criteria. After applying the inclusion criteria, 39 previously published articles were found. To conclude the research and review the papers to be studied, specific exclusion criteria were then applied. The first criterion of exclusion was to remove duplicate articles. Secondly, the papers that were not accessible in full text omitted. The final criterion for exclusion was the exclusion of papers that had no direct association with the effectiveness of game-based learning strategy in higher education. Finally, the main sample of this systemic review study was determined to be a total of 20 previously published articles. The main selection process is summarized in Figure 2.

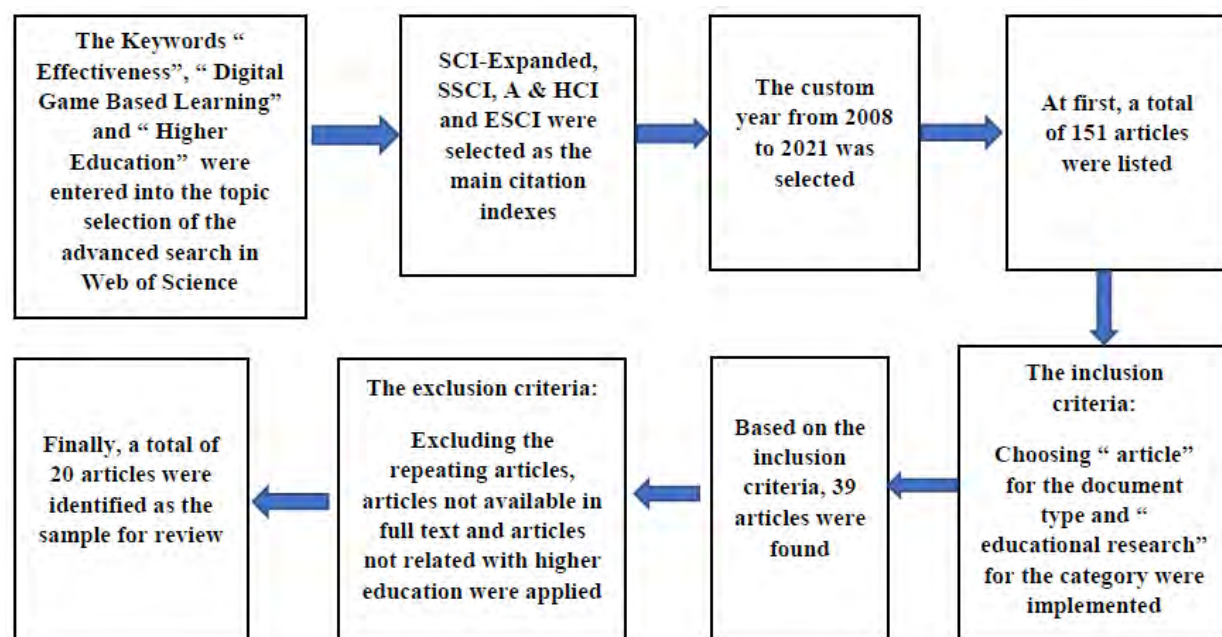


Figure 2. Article selection process of the study.

2.2. Data Collection

A total of 20 articles were listed based on the systematic search of the published research and review articles from 2008 to June, 2021. We used the publication classification forms to collect data from the listed articles (Goktas et al., 2012). The form contained the following 5 main categories: 1- Article information, 2- Research methodologies, 3- Tools for gathering data, 4- Sampling, and 5- Methods for analyzing data. To better understand the study or implementation of a game-based learning strategy, main topics in higher education were added to these categories. Various game types were also added to the form (Calderón & Ruiz, 2015) such as the computer game, mobile game, virtual worlds, web-based game, board game and video game.

2.3. Research Questions

RQ1: What is the role of adult learning theories in digital game-based learning?

RQ2: How much of the digital game-based learning strategy is effective in higher education?

RQ3: What are the barriers and their solution in using digital game based learning strategy?

3. Review of Literature

The most important goal of applying a digital game-based learning approach is to improve engagement and motivation of the learners. Since learning is a dynamic procedure, it involves inspiration to start and continue. Therefore, gamification increases motivation and attracts learners. In addition to competition, gamification can also cultivate students' sense of pride and accomplishment. In the previous decade, numerous issues related to digital educational games were extensively debated due to rapid development of computer instruments and multimedia technology. A lot of research work has shown that digital games can be an active way for endorsing an engaging learning environment (Partovi & Razavi, 2019; Tsai, Huang, Hou, Hsu, & Chiou, 2016). Results of numerous researches have described that digital educational games can improve pupils' attention and inspiration towards learning (Jin, Tu, Kim, Heffron, & White, 2018; Liu & Chu, 2010). Eutsler (2021) also pointed out that well-established digital educational games can have great potential to improve student learning achievements. Though digital educational games appeared to be a promising approach, investigators pointed out that without the right design of digital games, usage of digital game-based approaches can have negative effects, such as poor educational outcomes and an increase in player self-avoidance behaviors (Van Eck, 2015). Kickmeier-Rust and Albert (2010) proposed that a major challenge in digital games development is providing support and guidance to learners while maintaining a balance between learning and play, challenge and the ability of each individual learner. Research conducted by Cahyana, Paristiowati, Savitri, and Hasyrin (2017) has further confirmed this point of view by performing an activity utilizing digital games. Thus, it is imperative to offer appropriate support for learning when using digital games.

A number of research studies showed that digital games used in educational activities improve students' academic achievements and performance. Huang, Huang, and Tschopp (2010) presented results of a study by surveying 264 undergraduate studies for playing online digital games and showed a significant connection between intrinsic motivation and rewards. Plump and LaRosa (2017) further investigated children's flow experience in a communicating social game learning environment and indicated that challenging and complex elements in games have larger impacts on learner's flow experience, making the feedback clear. Dickey (2011) examined the influence of digital game-based learning approach and indicated that intrinsic inspiration, interest and rationality benefit from a digital game-based learning environment. Cobos et al. (2018) showed that compared with traditional learning, the digital game based learning has meaningfully better effects on learners' knowledge retention and perception of educational value. Recently, Noroozi et al. (2020) found that compared with traditional learning, students using digital game-based learning showed a smoother experience and better performance in problem solving.

In addition, scholars have also endeavored to come up with procedures or outlines for the design of digital games. Villalta et al. (2011) suggested a procedure for the development of existing classroom multiplayer games (CMPGs). These games are played on projection screens at the front of classroom through which pupils cooperate with others. During the CMPG event, each player has their own input device to control the game's avatar. Hsieh, Lin, and Hou (2015) proposed a framework for performing game activities, allowing pupils to participate in the design of educational computer games in a collaborative way. The projected framework effectively improved the collaboration learning in the classroom. Mozelius et al. (2016) also reported that promoting student interaction in digital games helps students improve their learning outcomes.

4. Results

RQ1: What is the role of adult learning theories in digital game-based learning?

Reviews of existing digital games show that game designers apply cognitivist and constructivist foundations and their amalgamations. The review also believes that all learning models can be used to design the game (Plass, Homer, & Kinzer, 2015).

4.1. Constructivism

The constructivist paradigm says that an individual builds his knowledge and understanding of the world, experiences things and does not reflect these experiences. Constructivism is the context and content needed for mobile learning and mobile learning teamwork and active collaboration (communication through mobile phones, or with students). Constructivism is a concept of behavioral learning. It can achieve game-based learning in this digital age. Each student can learn how to tackle the challenges and make conclusions through games. Using game-based tools, participating pupils and staff can accept learning instead of displaying it a destructive load (Padirayon, Pagudpud, & Cruz, 2019).

4.2. Social Constructivism

Computer games are dynamic tools for learning because they can improve student achievement by combining conversations with social interactions between pupils and teachers. In support of social constructionism, digital game based learning approach provides group members with the opportunity to combine their previous experiences in other environments with the knowledge of the other players (Bressler, Olman, & Vallera, 2018).

4.3. Cognitivism

By cognitivism, learners become the central role of interest and attain information through various forms. This allows players to identify problems, analyze them, and apply past learning. Cognitivist learning is the acquisition of knowledge using a variety of methods that can be applied to link symbols in an expressive and outstanding way and to identify and analyze problems. There are several ways one can expedite the process of having a game as described in (Plass et al., 2015). These are:

- *Situatedness*

Digital games can put the information to be learned in place when it's needed, creating a meaningful context for learning to take place. Also, they can mirror real live scenarios, which contribute to the application of the knowledge acquired.

- *Transfer of Learning*

When it is necessary to practice skills and apply knowledge, digital games facilitate the transfer of learning by creating different but related situations. This helps to apply any knowledge to the abstraction required for new situations.

- *Scaffolding and Relevant Feedback*

The digital game provides information to train new players. Additionally, they provide feedback where players may encounter difficulties. Digital games sometimes use tutorials to support game-related learning.

- *Dynamic Assessment*

Digital games usually adjust the tasks that students will complete according to their current level. Solving the current task will determine the player's next problem to be solved or change the topic. Activities performed by students usually provide information about the students' current knowledge and skills.

- *Representation of Information*

Digital games play an important role in visual design and information presentation. Information can be expressed in many ways and players must recognize and integrate these ways. When information is available in more than one format, learning becomes easier.

- *Learning Mechanics*

The mechanisms that exist in the game must be consistent with learning goals. The learning mechanism can determine the speed of learning and the participation and enjoyment of students.

- *Gestures and Movement*

The embodiment of learning, mapping gestures or actions to learning content is considered a cognitive effect. Digital games can use virtual environments that provide gesture input, so they are well suited to provide this implementation.

Table 2 shows the role of cognitivism and constructivism learning theories in the digital game based learning process. According to this table, the games based on cognitivism theory provide intrinsic motivation and the games based on constructivism theory provide external tools for generating knowledge.

Table 2. Role of learning theories in digital game-based learning process.

No	Theory	Details
1	Cognitivism	Games in this category provide intrinsic motivation because they involve an orientation towards discovery and investigation. These games are context-based and provide active knowledge building, and problem-solving is the key meta-skill employed. This means a student-centered vision where individuals actively build their understanding due to the integration of learning experiences and games.
2	Constructionism	This view is similar to cognitivism. Games in this category emphasize external tools for generating knowledge. Some popular gaming platforms are associated with this.

RQ2: How much of the digital game-based learning strategy is effective in higher education?

Traditional classroom learning depends on unexciting learning skills and lacks interaction. The students of the current century belong to the digital age and they look forward to new learning methods, digital projects and interesting valuation models. New learning methods introduced into higher education attract learners and explore the practice of self-learning, thereby paving the way for better knowledge, skills and abilities. With numerous inventions in information and communication technology in the higher educational environment, a game-based learning approach is one of the innovative learning approaches that have aroused the interest of many universities. Information and communication technology paradigm shifts are entangled with various teaching methods adapted to students in the 21st Century (Afari, Aldridge, Fraser, & Khine, 2013). Information and communication technology has improved the efficiency and flexibility of learning and training systems and can be implemented in work settings, linking formal learning with informal learning. Information and communication technology helps universities prepare students through primary education and continuing professional development in international and global markets. Research on the adaptability of information and communication technology in teaching shows that technological innovation in this field is achieved in different ways (Shah, 2017). Changes are needed from all levels of systems, organizations, and individuals to put the new teaching methods into practice. Teachers need to continuously develop teaching in their own teaching environment. These teaching environments are usually the junctions of different cultures and the most diverse groups of students and experts. Information and communication technology-assisted learning environments are becoming increasingly common. They require teachers to be able to use new systems and tools and new communication methods in a multicultural environment. The organization and system levels, the planning and implementation entities require quality assurance (Plass, Mayer, & Homer, 2020).

Table 3. Reviewed studies on the effectiveness of digital game based learning strategy.

Sr. No	Author/s	Discipline	Level	Results
1	Darling, Drew, Joiner, Iacovides, and Gavin (2008)	Engineering	Undergraduate	Game-based learning enhances a variety of student skills, including vision, space, technology, language, dynamics, cognition, socialization, and collaboration. It also improves your ability to discover and learn new concepts.
2	Daz and Martn-Prrega (2014)	Primary Education Course	University Students	Once teachers have been taught in how to use videogames in the classroom, they will be eager to do so.
3	Belova and Zowada (2020)	Pedagogical Content Knowledge	M. Ed. students	The game's initial trials in three university courses revealed an overwhelmingly positive response.
4	Hosseini et al. (2019)	Computer Science	Undergraduate students	Game based learning strategy improves the self-efficacy of the learners
5	Vásquez, Peñafiel, Cevallos, Zaldumbide, and Vásquez (2017)	Fundamental Algorithms course	Graduate students	Students are constantly receptive to new learning experiences, particularly when they use games as a means of learning
6	Cózar-Gutiérrez and Sáez-López (2016)	Social Science Subject	Second Year University Students	The researchers like the fact that gaming-based learning in immersive environments helps pupils to learn with greater activity and commitment. The degree of interest, education innovation, motivation and statistically significant gains are regarded favorably.
7	Wardoyo, Satrio, and Ma'ruf (2020)	Development economics, management, and accounting	Undergraduate Students	Analyses revealed that the usage of game-based learning is extremely beneficial for increasing learning outcomes.
8	Nadolny, Alaswad, Culver, and Wang (2017)	Patterns and design of game mechanics course	Educators	Games help learners to improve the quality of their deductive reasoning.
9	Troussas, Krouska, and Sgouropoulou (2020)	Programming language	University level students	Students' involvement in higher education is boosted through mobile game-based learning.
10	Huang, Chang, and Wu (2017)	English Vocabulary	Undergraduate students	The game-based learning strategy improves the learners performance
11	Gil-Doménech and Berbegal-Mirabent (2019)	Mathematics	Business Administration Degree	The favorable results gained, not only in terms of acquiring information on derivatives and integrals resolution, but also in terms of student happiness, urge us to use this activity in future editions of the course.
12	Hwang, Chiu, and Chen (2015)	Social Studies	Undergraduate students	The game-based learning strategy highly engaged the learners.
13	Crocco, Offenholley, and Hernandez (2016)	English, Math and Science	Undergraduate courses	This study provides preliminary support for the claim that this setting deep learning can be improved by increasing GBL fun.
14	Sung, Hwang, Lin, and Hong (2017)	Geographical Studies	Undergraduate Students	The method enhanced student desire for studying and a profound learning strategy.
15	Ding, Guan, and Yu (2017)	Finance class	Undergraduate	Study results showed that students' performance is slightly improved after the introduction of simulation games.
16	Silva, Rodrigues, and Leal (2019)	Accounting and Marketing	Undergraduate students	Overall, the motivation and interest of students improved by integrating games into the curriculum and indicates that games may be an effective approach for students to learn.
17	Mathrani, Christian, and Ponder-Sutton (2016)	Programming module	Undergraduate	The animated game showed that students are highly engaged. Some students have found that using game elements is a better way to express the logic of the program when making oral statements for the final assessment.
18	Eltahir, Alsalhi, Al-Qatawneh, AlQudah, and Jaradat (2021)	Arabic language	Higher education	Game-based learning strategies developed higher inspiration in pupils than traditional strategies.
19	Chang, Kao, Hwang, and Lin (2020)	Novel pedagogy	Nursing school students	The game-based strategy significantly enhanced learning skills and engagement of the learners
20	Abbott (2019)	Pedagogical course	Postgraduate students	GBL has been suggested as a new and successful way of teaching high-level functional learning results, including academic research capacities.

Recent research studies suggest that students growing up in a digital game-based learning environment are psychologically dissimilar from generations of traditional learners. This is demonstrated by the fact that it offers a direct association between the struggle and the instant rewards that have been spent digitally all over the world. On the other hand, digital students prefer to learn relevant, aggressive, immediate and fun things (Chang et al., 2020). The famous psychiatrist (Glasser, 1999) claimed that there is a close link between fun and learning. Glasser's theory of choice regards fun as a basic requirement that drives social behavior.

In an educational environment, it is well known that computer games can provide a variety of benefits, such as involving students in an active learning environment, increasing inspiration, enhancing information retaining and improving real life problem-solving and critical thinking skills. Moreover, computer games let student groups share the knowledge learned, resources, skills and to collaborate to solve real life educational problems (Byun & Loh, 2015). Supporters of computer game-based learning believe that educational computer games have the ability to change the way of pupils learning styles and can inspire and involve a new group of students in a way that traditional learning approach does not have (Romero & Kalmpourtzis, 2020). Nazarova and Galiullina (2016) pointed out that the game-based learning strategy has a motivating effect, because the players need to find facts and information to be successful complete the challenge. Lin, Liu, and Shih (2010) stated that numerous learners found digital game-based learning strategy had a constructive effect on their inspiration, attitude and fluency. According to the research results of Vu and Feinstein (2017) the application of game-based activities in the learning process can improve students' academic performance in test scores and behavior. Sitzmann (2011) presented the results of 65 studies showing that students who used game-based technology performed better in terms of knowledge and retention. Lee, Luchini, Michael, Norris, and Soloway (2004) found that students who frequently played portable games completed almost three times the number of questions in 19 days than those who used paper worksheets. Merchant, Goetz, Cifuentes, Keeney-Kennicutt, and Davis (2014) investigated the impact of game-based learning approach in a virtual environment. analysis showed that VR-based teaching has many benefits and evidence in improving learning outcomes. The results of the studies review in Table 3 clearly indicated that digital game-based learning strategy has significant effects on the student's engagement, collaboration and critical thinking skills. It can be concluded from the reviewed studies that digital game based learning strategy must be used in the classroom to highly engagement the learners.

RQ3: What are the barriers and their solution in using digital game based learning strategy?

4.4. Barriers in Use and Adoption of Digital Game-based Learning

Some barriers and limitations were reported in the literature. These are as follows:

(i) Highly Cost

The cost of developing a custom game-based learning curriculum for individual courses has always been considered too high to meet the cost requirements of broader acceptance. Higher educational institutions want to reduce material costs for learners. If they want to expand activities in courses, they must be able to manage maintenance costs. The high cost involved also makes the digital game-based learning approach a challenge for instructors to innovate because if the price is high, they don't have the budget to test new game-based methods.

(ii) Needs too many changes in curriculum and class interruptions

Instructors are interested in the benefits of digital game-based learning, but not if too many courses need to be changed or modified. They favor the ability to use digital game-based structures to enhance value without having to substitute other verified elements of success in their curriculum.

(iii) Time Consuming Work Flow

Digital game-based learning is considered to be time consuming on the part of students, faculty and staff. Instructors say they want options that can accommodate their existing work styles, and students need an experience that is efficient and meets their needs.

(iv) Inability of Instructors to Update of Digital Game-based Learning Resources

The creation of digital game-based learning resources usually involves appointing a developer to generate and distribute the final product, which usually needs to be returned to the developer for changes or updates in the future.

(v) Difficult to Assess on a Large Scale

Digital game-based learning strategy can provide a large number of results for assessment, but generally requires teachers to do much additional work to investigate these results and integrate them with a scoring system.

(vi) Difficult for Faculty Members to Integrate and Use Digital Game-based Learning

Some instructors worry that complex digital game based learning activities require skills that many teachers do not possess. Instructors are required to be able to rapidly understand how digital game-based learning activities work and allow learners to easily participate in them.

(vii) Challenges in Technical Support System

Teachers and administrators are concerned about digital game-based learning's support requirements. They require game-based learning to be instinctive and work on dissimilar devices.

4.5. Solutions to the barriers in Game-based Learning

a. Enable Instructors to Maintain Game-based Learning Resources

The instructors are provided with the tools and models that allow educational designers to generate game-based learning skills. This permits instructors to advance and appraise the environment constructed on student

input. Put the tools and resources in the curriculum and support the teachers to become familiar with digital game-based learning strategies.

b. Fit into Curricula

It should be focused on short learning practices that can be used with current courses and that are appropriate with the schedule of teachers and students. The previous research has shown that if the design has clear goals and feedback, a short digital game-based learning experience is effective.

c. Flexibility and Mobility of Digital Game Based Learning

A digital game-based learning allows students to learn and progress in a short amount of time by providing short and game-level modules that can be started and completed quickly, and easy to access. Digital game-based learning should also be applied to computers, tablets, and mobile phones, as students want to access their materials from any device they own and increasingly use mobile phones to complete their studies.

d. Proper Utilization of Learner's Time

Digital game-based learning modules will get students started quickly without any training or tutorials. They should also be efficient and avoid prolonged web browsing or other open games that do not support learning.

e. Multiple Game Types for Multiple Objectives

Use game mechanics that meet the students' learning goals. Game mechanics is often developed by observing the roles and behaviors suggested by the learning goals. To support this, it makes sense to provide educators with a variety of templates and tools that can handle a variety of subjects and goals. Digital game-based learning resources must be purposeful, efficient and effective.

f. Comprehensive and Scalable Assessment

Assessments should be an essential part of game-based materials, and authoring tools should allow instructors to build and integrate assessments as part of a game-based experience. Digital Games should also offer students with a formative response on their performance in a timely manner and provide assessment information so that teachers can effectively manage the classroom and assist individual learners.

g. Create A Validated Model and Establish an Evidence Base

The use of authoring tools provides evidence for advancing this field to make and test more digital game-based learning interventions quickly and inexpensively. Tested and validated templates provide a validated model to build digital game-based learning practitioners of today and tomorrow.

5. Discussion

Compared with traditional learning strategies, a digital game-based learning strategy promises more learners motivation by offering content in collaborative, rule-based and competitive manner (Snow, 2016). Digital games have unique properties that have been used by educators for decades to create active and dynamic learning practices that succeed from primary educational levels to higher educational levels in all fields of education. Research has indicated the potential of a game-based learning strategy with successful implementations in many areas. Digital game-based learning strategy is utilized in the higher educational context to benefit learners in a diversity of disciplines including social sciences, business, science and applied science, medicine, language teaching and learning, engineering and technology. Digital game-based learning strategy enables the learners to take an active and dynamic role in solving complex problems and developing technology in a way that integrates effective active learning methods (Hébert & Jenson, 2019). The following results were obtained by reviewing the literature related to the effectiveness of digital game-based strategy of learning in the higher educational context:

i. Learners Self-knowledge and Orientation

Digital game-based learning offers pupils a fascinating way to investigate their learning strengths and styles and discover options and requirements to make the right choices when choosing courses. The results of digital game based learning approach also provide useful information to help the course leader to work with other learners.

ii. Successful Academic Strategy

Through a digital game-based learning strategy, learners can practice different strategies and promote skills in areas including working with instructors, managing homework, utilizing resources, preparing homework tasks and time management.

iii. Positive Assessment with Safety of Students at Risk

For learners who have not achieved academic success before, a digital game-based learning approach can evaluate their abilities in a safe and non-judgmental manner and provide them with chances to promote skills in an encouraging way without failure.

iv. Development of a Growth Mindset

The growth mindset was proposed by psychologist (Dweck, 2015). It is self-learning in such a way that talent and intelligence are not static, but can develop and progress. The learners with a growth mindset can persevere in the face of challenging materials. In game-based activities, students can learn about the growth mindset concept and dynamically demonstrate their progress by achieving the game-based challenges. The learners feel anxious in fields where their skills are not solid. Digital game-based learning approach allows them to practice without any failure.

v. Learning by Trial and Error in a Safe Environment

A digital game-based learning approach gives students the chance to assess and advance their skills in a safe and sound environment in which failure is not an issue. Non-traditional students entering college can be sensitive to academic failure due to difficulties in high school. The opportunity to safely develop skills can save their lives.

vi. Providing Exercises to Build Skills

Digital game-based learning provides instant feedback for practice to motivate students to continue working and to improve.

vii. Role of Learners in Real-world Problems

A digital game-based learning approach engages learners in real-world characters, placing them in the scene and showing them the tasks they need to accomplish. The game-based experience can be used as a virtual internship where students can use what they are learning.

viii. Provide Students with Helpful and Timely Feedback

A well-designed game will provide players with instant feedback on their activities so that learners can understand their actions and decide what to do next. Students can quickly see where they have erred as they solve problems, try to correct them and see the results. This kind of rich and instant feedback supports learners to make improvements when they are learning on the train or late at night when teachers or classmates may not have time.

ix. Interact with Multiplayer to Develop Collaboration Skills and Build a Community

Multiplayer digital game-based learning allows two or more learners to collaborate or compete against each other to achieve objectives. The multiplayer-based game feature also supports group work in projects under online environments taking advantage of the effective synchronic and asynchronous communication model established in the game design community. The communication of multiple people helps to build communities under online learning environments and provides students with the opportunity to develop interpersonal and job skills.

6. Conclusion

The digital game-based learning strategy meets the real time requirements of adults and has become the most widespread computing activity by offering a new form of communication. Some advantages of a game-based learning strategy are that they are attractive, novel, provide critical thinking skills-based environment and support learners to focus on homework independently. In digital game-based learning strategy, students participate fully in the learning process with great intention. To find the evidence of the effectiveness of the game-based learning in the higher educational context and the role of learning theories in digital game-based learning process, a review study was conducted. The review of the research indicated that the game-based learning strategy is an effective and dynamic way of learning in a higher educational environment. The review of literature also showed that the game-based learning process is based on behaviorism, constructivism and cognitivism learning theories. Some barriers reported in this study are the high-cost learning process, requirement of the up-to-date curriculum and difficulty integrating the game-based learning in the curriculum. The suggested solutions to the barriers for implementing digital game-based strategy presented in this study are to enable instructors to maintain digital game-based learning resources themselves, proper utilization of learner's time, multiple game types for multiple objectives, create a validated model and establish an evidence base. Further studies should be conducted to find more favorable results of using a digital game-based learning strategy in the higher educational context.

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