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A Review on Articles Related to Effects and Factors Affecting Gamification

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ABSTRACT

Purpose: Despite progress in the world, education has not changed much compared to previous years, and despite the variety of teaching methods, poor learning is one of the challenges in education. Applying educational games in teaching and learning can be a solution to this problem. In the last decade, research has been conducted around the world to evaluate the effectiveness of educational games. A review of the literature is needed to examine the effectiveness of serious games in education, as the number of studies on serious games is increasing and some studies have tried to meta-analyze this issue.

Method: For this purpose, the studies conducted on the effects of educational games are examined using the library method. Educational games, gamification, game, meta-analysis, and similar keywords were searched on Web of Science, Scopus, and Google Scholar, and 32 articles were selected and analyzed. The selected articles were reviewed in terms of positive findings, negative results, and effective factors in improving educational games.

Findings: The results indicate the effectiveness of educational environments in the game on increasing the learning, participation, and motivation of learners.

Conclusion: The present study tries to provide an overview of studies, especially meta-analytic studies in the field of game-making, although it was accompanied by limitations such as not reviewing studies published in a format other than journal articles and conferences. Research such as the present study can provide a broad perspective for the use and design of educational games in the educational process. **©authors**

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1. Introduction

The past decade has been witnessing rapid development of information technologies, together with rapid development of serious games. With the increasing application of technology assisted education, there is an urgent need to investigate the effect of serious game assisted learning. An increasing number of studies on serious games are also emerging, which needs to be reviewed to show future research directions and reveal the features of successful serious games. Designs of serious games and their application to education are also in need of the review of literature, which helps designers and teachers to better their professional work in the future (Zhonggen, 2019) In unison with technological advances in society, the role of technology in education has undoubtedly become central in recent years. This key role has been further emphasized by learners' needs to confine temporarily in many parts of the world during the ongoing pandemic world. Out of a plethora of technological possibilities, a popular technological option both in class and beyond the class is happening through the use of digital serious games, which are aimed at learning specific educational content through digital gameplay. (Serra., & Gilabert, 2021)

One of the most important and recent developments in the field of new technologies that have led to more attractive serious spaces, is the use of gamification or in other words the use of game elements in non-game environments. Gamification is the use of game mechanics, aesthetics, and game thinking to engage people, motivate action, promote learning, engage, and solve problems (Nicholson, S. 2015). Examining the effects of gamification in education can be a good guide to use or not use gamification in education, and you give this right to educational designers to make more confident decisions about gamification. Various types of research have been conducted on the effects and factors affecting gamification. These studies have reached different results. In this research, we examine these studies and based on the results, they are placed in two tables of positive effects and negative effects of gamification. Accordingly, their review and comparison become faster and easier as well as presenting the factors affecting the effectiveness of educational games. Using the findings of the reviewed articles helps to implement and increase the effectiveness of gamification.

2. Literature Review

Gamification:

The concept of gamification is now very broad and diverse, such as education and learning, health and e-commerce, the environment, the hotel, assets, and so on. The results of research by Hamari et al, 2014 showed that the most common use of the concept of gamification has been in the field of "education and learning" (Hamari et al, 2014).

Content gamification

It is possible to play the structure and content of educational environments. Content gamification is the use of game elements, game mechanics and game thinking to play content.

Structural gamification

Structural gamification is the use of game mechanics to help guide the overall content so that there is no change in the content (Kapp, 2012). Table 1 and 2 show the element of structural gamification and Content gamification, respectively.

Table 1. Elements of structural gamification (Kapp, 2012)

Rules	Are what make all the other elements of structural gamification work, the badges, the rewards, the points, even the leaderboard
Reward structure	Consists of all the ways learners are rewarded for activities within the structural gamification platform
Leaderboards	Is a list of the individuals who have the highest scores or most points or who have achieved higher levels

Points	They can be used to reward progress and correct answers, they can be a way of achieving social status, they can be used to unlock content, and even spent as currency to obtain virtual or physical goods
Currency	Can be thought of as a specialized kind of points—points that can be used to acquire other items
Badges	Is a visible symbol of accomplishment
Leveling up	Gaining enough points to go to the next area of content, earning a new badge or series of badges, or even mastering a certain portion of the curriculum
Social sharing	Showing off badges is a way to share accomplishments and achievement of non-linear goals

Table2. Elements of Content gamification (Kapp, 2012)

Story	Provide a context for placing information, provides the learners with an engaging way to learn about the content you are teaching
Challenge	Plays a big role in engaging learners, is a strong motivator in learning
Curiosity	People are naturally driven by curiosity, so game developers take advantage of that by creating different levels and places to explore within games
Character	Having an avatar appear on the screen can be motivating to learners because they somehow feel more accountable to a "person" than to a computer.
Interactivity	Encouraging learners to engage with content is what leads to deeper levels of learning
Feedback	Is a critical element in learning
Freedom to fail	Provides trial-and-error

Serious Games

Serious Games (SGs), defined as a game in which education (in its various forms) is the primary goal rather than entertainment, have been proven as an effective educational tool for engaging and motivating students (Cano et al, 2018). Serious games are designed for a purpose other than pure entertainment, as defined by Djaouti et al (2011). Serious games are known as fun tools for educational purposes, where players develop their knowledge and practice their skills by overcoming various obstacles during the game. Players' performance scores during the game process (Juan et al, 2017). If players overcome an obstacle, they will receive rewards such as points, progress and power. (Serra., & Gilabert, 2021)

Digital learning games

Digital learning games are found in many formal education settings where teachers aim to reinforce mainstream and focus on skills and academic knowledge, such as math or literacy (Moyer-Packenham et al, 2019). Games gradually introduce challenging content, create learning through instant feedback, and can reinforce skills through repetition and motivated practice (Clark et al., 2016). Games can be useful for children with reading difficulties when they play in groups and in which children practice and reflect aloud on their comprehension and learning strategies (Vasalou et al., 2017).

One of the reasons for the effectiveness of serious games in education may be their influence on learners 'mood. Gaming, as an entertainment outlet, plays an important role in mood formation such as sadness, happiness, and anger (Nazry et al, 2017)

Digital Game Based Learning

Digital Game Based Learning (DGBL) refers to any form of use, or integration, of digital games in learning environments. Previous research shows that digital game-based learning (DGBL) can have positive effects on engagement, motivation and learning, and that using narratives may reinforce these effects. Narratives are one of three core game structures, alongside rules and space. (Breien., & Wasson, 2021).

DGBL spans from serious games developed with learning or instructional objectives, to student game design activities to explore a subject matter, and the use of commercial off-the-shelf (COTS) digital games to address both content-based and high-order learning outcomes (Van Eck, 2006). (Van Eck, 2006) Serious games are growing in popularity (Hersh & Leporini, 2018)

Digital game-based learning (DGBL) is a frequently adopted mode for facilitating teaching and learning, where learners are immersed in game contexts to engage in gameplay and to construct meaningful knowledge. However, without guidance, students might have difficulties organizing what they have experienced in gaming contexts. Thus, in this research, a multidimensional repertory grid (MDRG) approach was proposed, and a digital game was implemented accordingly. Students will have better learning progress as well as higher learning motivation, self-efficacy and metacognitive awareness, and those who learn with the proposed strategy are more likely to promote higher-level thinking. (Hwang, 2021).

The research results of Majuri, J., Koivisto, J., & Hamari, J. (2018) show that gamification in teaching and learning usually uses costs that indicate success and progress, while social and immersion-oriented costs are much less are common The results reviewed in the studies focused mainly on quantifiable performance measures, and the results reported in the reviewed studies were overwhelmingly positive (Majuri, et al.,2018).

Serious game is considered as a special form of active learning, problem solving, situational and social with fast and distinctive feedback that also increases the pleasure of learning (Tobia et al, 2011). Although serious digital games have been increasingly used in formal education, they seem to provide a very exciting way to learn (Camacho & Esteve, 2018). A number of researchers (Hainey et al., 2016; Vanbecelaere, et al., 2020) have argued that there isn't sufficient empirical evidence to support digital game-based learning as a better classroom resource than more traditional methods. In contrast, a number of studies have shown positive effects of learning games in the areas of motivation to learn and learning outcomes (Connolly, Boyle, MacArthur, Hainey & Boyle, 2012; Ke, 2009; Lee & Peng, 2006; Vogel et al, 2006). Gamification has been considered and implemented in the field of education, but empirical studies have reported different results regarding the effectiveness of gamification in educational practices, and while the amount of research in this field has increased, subsequent knowledge is scarce and limited. Some studies have reviewed these articles, for example, Majuri, J., Koivisto, J., & Hamari, J. (2018) who reviewed 128 empirical research articles, but the number of these studies modeled against the high volume of research. Experimental studies in the field of gamification are few. In our research, in addition to new experimental studies, we also examine meta-analytic studies.

3. Method

The research method of the current research is the library method on various articles, especially meta-analytical articles in the field of educational games. The researcher first selected keywords related to the research topic and searched for articles published in the international Web of Science, Scopus and Google scholar databases.

Keywords and phrases of game, gamification, educational game, serious game, game-based learning, computer games, serious digital game, meta-analysis in title and abstract of articles were searched. By studying the titles and abstracts, we first examined and removed items that were not related to gamification. Also, articles that were published before 2010 were deleted and articles that were not published in magazines were deleted. Articles that were not positive findings about the use of serious games in education, negative findings about the use of serious games in education, and factors affecting the effectiveness and efficiency of educational games were excluded from the evaluation. Then 32 articles remained and were used for evaluation. Selected articles have been published in magazines from 2011 to 2022. Articles were evaluated by one person.

4. Findings

All selected articles were reviewed and analyzed, the results of which are shown below. In the first part, positive findings in the use of educational games were expressed. After that, negative results in the use of educational games were presented. Factors influencing the effectiveness of

better and more educational games were written and at the end of this section, the findings were summarized in a table.

1.1. Positive findings on the use of serious games in education

Educational technologies, such as digital games, offer the potential to participate in math learning activities. In a meta-analysis of 20 studies, Fadda et al (2022) stated that, in general, the findings show that digital games are an effective tool compared to conventional teaching methods. The results are promising and can be useful for designing digital educational interventions aimed at promoting motivation in mathematics. (Fadda et al, 2022)

Games are considered as a potential tool to empower students. The study by Hsu & Cheng (2021) showed that students can learn from the Bio Detective game because significant advances have been made in science results. Students who are fully immersed in Bio Detective act more like professional solvers to immerse their peers without experience. Better efficiency in solving their problems and behavioral patterns showed that they have more exploratory and deductive thinking strategies.

There are many findings in serious game-assisted learning, most of which are supportive and have few negative consequences. Learning immersed in serious games can facilitate learners' comprehensive understanding of scientific concepts due to improved performance in science and long-term preservation of scientific knowledge. Immersion in the game was also positively correlated with the performance of learning science (Cheng et al, 2017). Serious games were effective in strengthening cognitive and emotional abilities as well as a pleasant mood in general learning. Through the analysis of 46 experimental studies, serious games were reported for learners to acquire cognitive abilities and increase the positive impact of useful learning (lamb et al, 2018).

Serious games are considered as an effective educational medium to meet the different needs and expectations of learners. Although no significant difference was observed in academic achievement. Significant positive attitudes were shown towards serious play-assisted learning compared to traditional paper-based learning. Serious learning through play can provide flexible learning for different learners who can move beyond the limitations of traditional learning (Garneli, 2017). Educational technologies, such as serious games and mobile applications, enhance learners' academic achievement and encourage their participation in learning activities. Educational or serious games can act as an effective tool to improve science teaching (lamb et al, 2018).

Vogel et al (2006) conducted a meta-analysis to decipher which teaching methods, games, and interactive or traditional simulations are more effective. Combined the results of 32 studies from 1986 to 2003 focusing on pre-test-post-test comparisons of cognitive and attitudinal results in games and simulations for preschoolers to adults. Combined studies compared games and simulations with traditional classroom instruction. It was found that games and simulations lead to higher cognitive outcomes ($z = 6.05$) and attitudinal outcomes ($z = 13.74$) than traditional education.

However, considering specific moderating variables gave a more complex picture. For example, men showed no preference while women showed a preference for games and interactive simulation programs. Also, there was a great deal of preference for interactive games and simulations as students reviewed the programs themselves. However, when the teachers controlled the programs, no significant advantage was found. In addition, when the computer imposed the program sequence, the results were in favor of traditional teaching methods over interactive games and simulations (Vogel et al 2006).

Compatibility is one of the components of serious digital games that is claimed to have a potential advantage over non-digital games. Recent serious games have begun to include an adaptive component that allows the user's learning path to be personalized through sophisticated algorithms. (Vanbecelaere, et al. 2020). Beyond the current discussion of a more precise definition of the more general concept of personalization, adaptation is defined here as the

ability of a system to adjust instruction based on learner's abilities and / or preferences, at any particular point in the instructional process, with the aim of acting on characteristics Identify the learner and define performance improvement and learning. (Oxman & Wong, 2014). Hence, it allows the automatic adaptation of game elements such as content, user interfaces, game mechanics or game difficulty in order to personalize or personalize the interactive experience (Holmes et al., 2018). Such customization and adaptivity, some scholars have claimed, have the potential to cause faster and more effective learning. The claim, however, has received only partial empirical testing and support. (Serra., & Gilabert 2021)

Serious game-based learning is significantly more effective than non-game learning. Learners were involved in serious game-based learning significantly longer than non-game-based learning. In the previous learning approach, learners and teachers were significantly more motivated, desirable, helpful, and less constrained than the latter. It has been experimentally proven that learners who learned through serious games scored significantly higher than those who learned through games, although no significant differences were revealed in the knowledge tests (Bakhuys Roozeboom et al, 2017).

Wouters et al (2013) used meta-analytic techniques to examine whether serious games are more effective and motivating in terms of learning than conventional teaching methods (learning: k = 77, N 5547, motivation: k = 31, N 2216). According to the hypotheses, serious games were more effective in terms of learning, but they were not more motivated than conventional teaching methods.

The theory of interactive cognitive complexity shows that simulation games are more effective than other educational methods because they simultaneously involve trainees' emotional and cognitive processes (Tennyson & Jorczak, 2008). Meta-analytical techniques were used to evaluate the educational effectiveness of computer-based simulation games in comparison with the comparison group (k = 65, N = 6476 from 1976 to 2009). According to the theory, self-efficacy after training was 20% higher, expressive knowledge 11% higher, procedural knowledge 14% higher, and retention 9% higher for trainees trained with simulation games than the comparison group (Sitzmann, 2011)

Tsai & Tsai, (2020) in a meta-analysis examined the relative effectiveness of learning science-based learning versus other educational methods. On play significantly increases students' acquisition of scientific knowledge at all levels of education (Tsai & Tsai, 2020).

Tokac et al (2019) in a meta-analysis of the effect of game-based learning on math progress after reviewing 24 studies, stated that math video games help to increase learning compared to traditional teaching methods, as well as the year of publication and its type. Has influenced the effect of video game intervention (Tokac et al, 2019).

The results of meta-analysis of digital games and student learning in 57 studies showed that digital games significantly increase student learning compared to non-play situations (clark et al, 2016).

1.2. Negative findings in the use of serious games in education

The study of Chase et al (2021) provides evidence that some common game characteristics can prevent players from enduring defeat, challenging, and learning in specific play areas. Chase et al (2021). Also, some negative results were found, especially in terms of the correlation between mental workload and learning effect. The nature of serious play had a negative effect on the relationship between mental workload and the effect of learning. Cowley et al (2013). Sitzmann (2011) states that when the training that the comparison group received as an alternative to the simulation game actively involved them in the learning experience, the trainees learned less from the simulation game than from the comparative training method and learned less through play. The results also showed that the use of a scoreboard that shows the superiority of men increases women's anxiety (Albuquerque et al, 2017).

1.3. Factors affecting the effectiveness and efficiency of educational games

1.3.1. The effect of anticipated fun and desire to play

Serious games often have a positive effect on learning motivation and learning outcomes. However, few studies have examined how these factors relate. Therefore, an empirical study was conducted to test the relationship between predictable pleasure and playfulness, as well as the relationship between playfulness, cognitive learning, and motivational achievement. The analysis showed that predicted pleasure plays only a minor role in students' willingness to learn with serious play. Students' expectation that the learning game would be easy and informative was even more important. The level of real enjoyment of the game also had a lower impact than expected. While there was a correlation between pleasure and motivation to continue engaging with the theme of the game, no effect was found on self-assessed or tested learning outcomes. The results suggest that other factors, such as explicit learning tasks, in-game training and support, or complemented by teachers, may be more decisive than the in-game entertainment experience. Show the benefits of learning serious games. Children's enjoyment of a learning game affects their motivation to continue engaging with the subject being taught. However, pleasure had no significant effect on self-reported or tested learning outcomes. Therefore, to achieve more learning outcomes than serious games, the teacher must activate the children's prior knowledge and ensure that the software has good scaffolding functions (Iten & Petko, 2016).

1.3.2. The effect of feedback in digital games on learning outcomes

Wouters and Oostendorp (2013) in evaluating the effect of different educational dimensions included in digital games on learning outcomes found that feedback is one of the most important interventions to improve the acquisition of skills and knowledge and to some extent less in-game performance. The effect of feedback is vital to the learning of those who strive to read. A systematic and structured video analysis of the twenty-six children's play was also conducted, focusing on the moments in which the children made mistakes and the in-game feedback. The findings show that when accurate interpretation of children's play performance is supported and children are forced to try again, they benefit from feedback on the outcome of the game, so in educational games it is better for children to respond if the feedback is more effective. Wrongly forced to try again. In contrast, although descriptive feedback attracted similar levels of attention, children had difficulty understanding the content and therefore relied on tacit knowledge to correct their subsequent response (Vasalou et al, 2021).

1.3.3. The effect of adaptive play with non-adaptive play on learning efficiency

Over the past decade, many governments and ed-tech companies have shown a growing interest in digital personalized learning, leading to a variety of adaptive learning environments that are often game-like. However, little attention has been paid to the impact of these personal learning technologies on children's learning performance. Debeer et al (2021) in a study attempt to empirically confirm the beneficial effects of adaptive learning technology by analyzing report data from Number Sense (NSG), an educational game that teaches basic numerical skills. In total, 81 children were randomly assigned to use an adaptive or non-adaptive version of NSG in six sessions over a three-week period. Using a longitudinal item response model, children's progress in sessions and during sessions was modeled and compared between the two versions of the game. Regardless of the NSG version, children showed progress during the sessions. However, compared to non-adaptive NSG, progress during sessions was stronger in adaptive NSG. These results provide empirical evidence that adaptive digital technologies increase students' learning performance compared to non-adaptive digital technologies.

1.3.4. The effect of effective gamification elements on motivation

Scores, scoreboards and levels provide the most motivation for use in online learning environments (Rojas et al, 2016).

1.3.5. Investigating the interaction of learners and the consequences of learning science in different designs of participatory simulated games (team and individual)

Collaborative simulations allow users to participate in simulations by controlling one of the maps in the system that models the actual settings. Dynamic modeling is one of the basic features of participatory simulations that allows learners to see the exact effect of their participation on changes in the system. Students who learned through participatory simulations showed better reasoning and less misconceptions than conventional simulations. However, learners can overemphasize the competition to win multi-factor participatory simulations, and the tasks in participatory simulations can be very challenging for some learners. Examining student interaction models in two versions of a participatory game; A multi-team participatory simulation game (MPSG) and a one-team participatory simulation game (SPSG), the results showed that in MPSG social participation predicts behavioral conflict, while in SPSG, students' emotional participation plays an important role. Students who participated in MPSG performed better in systems thinking than SPSG students. Multi-Team Design Participatory simulation using competition between teams and intra-team collaboration can help students learn complex phenomena (Lee et al, 2021).

1.3.6. Effects of educational game narration on learning

Studies have shown that there is a consensus that DGBL can have positive effects on learning by motivating and engaging learners using narratives (Clark et al., 2016; Novak, 2015).

1.3.7. Investigating the effect of avatars on motivation and performance

A study was conducted to investigate how to integrate avatars in student communication in a way that increases performance motivation. Students were divided into three groups and to evaluate the effectiveness of the avatar, three types of avatars were considered, so that students in each group had to use one of these three types of avatars during their course: Actual-Self Avatar, Ideal-Self Avatar and Superhero-Student Avatar. The results showed that in order to improve the motivation and performance of students, avatars can be used as one of the elements of gameplay in educational environments. The second and third type avatars, more than the first type avatars, had an effect on students' motivation and performance in interactive activities based on avatars (Ratan, et al 2016).

1.3.8. The effect of traditional supplementary education (without games) on education with games

Comparisons that include non-game supplementary training in game conditions the results show that compared to game conditions, the results do not include non-game training (Sitzmann, 2011).

But clark et al 2016 came to a different conclusion. They stated that many studies of play conditions with non-play education included additions (e.g., students who participated in related class work in addition to play), no evidence that to be different includes whether it determines the conditions of the game.

1.3.9. The effect of group game and individual game on learning

Wouters et al., 2013 found that learners who play serious games in a group learn more than learners who play alone. Clark et al 2016 also stated that games with participatory team competition produced much larger effects than games that used single / competitive players ($b = 0.40$, $p = 0.001$, 95% confidence interval (CI [0.17, 0.63])).

1.3.10. Impact of surprise

Surprise can also be considered an important factor in the effectiveness of using serious games in education. Surprises in serious games improved the learning effect by stimulating cognitive structures. Surprise may have benefits for advanced language learners in terms of appropriate

reasoning skills. Therefore, a narrative that causes surprise can be used to facilitate reasoning skills and improve the learning effect (Wouters et al. 2017).

1.3.11. Impact of game duration on game effect

clark et al 2016 states that when games were played in a game session versus more than one session, the effects were significantly less.

1.3.12. Impact of active training; Amount and number of access to the game; Complementary training, play

The trainees learned more than a comparison group. When the simulation games passed the content actively and not passively, the trainees could access the simulation game as many times as they wanted and the complementary simulation game was for other teaching methods than independent teaching (Sitzmann, 2011)

They learned more when the game was completed with other training methods, when several training sessions were involved, and when players worked in groups (Wouters et al. 2013).

1.3.13. The impact of the role of educational support in play-based learning

Educational support increases learning in play-based learning (k = 107, N = 3675). The results indicate that educational support in game-based learning environments improves learning. GBL training support facilitates the acquisition of skills and knowledge. GBL training support facilitates the selection of relevant information by the player. Provide training support for organizing / integrating new information into the game (Wouters, & Van Oostendorp, 2013).

1.3.14. The proportion of educational games with comprehensive features, content, purpose:

Serious games should be suitable for different learners and content. Those who meet the different needs of the learner and are applicable in different fields of study are more likely to succeed than those who fail. Therefore, the relationship between learning characteristics and game mechanics, which is an important influential factor, must be considered and implemented by teachers that can be integrated into educational programs and the learning process. This relationship played an important role in improving learning effectiveness and enhancing the learning experience (Lameras, 2017).

1.3.15. Impact of easy use of the game and teaching the game

Ease of use and game training were shown to be effective factors. Ease of use and informativeness of the game were more important factors than enjoyment to encourage participation in the game. Therefore, pleasure and motivation were not reported as influential factors. Although pleasure and motivation were positively correlated, no significant benefit was evident in learning outcomes due to both factors (Iten, & Petko, 2016).

Table 3. Summary of Positive findings

Promoting motivation in mathematics	**Fadda et al (2022)**
Significant progress in science learning outcomes Better problem solving efficiency More exploratory and deductive thinking strategies	**Hsu & Cheng (2021)**
Strengthen cognitive and emotional abilities as well as a pleasant mood Increase the positive impact on learning	**lamb et al, (2018)**
Positive correlation of in-game immersion with learning performance	**Cheng et al, (2017)**
Significant positive attitudes Learn flexibility	**Garneli (2017)**
Improving learners' academic achievement Encourage participation in learning activities An effective tool for improving science teaching	**lamb et al, (2018)**
Higher cognitive outcomes Higher attitudinal results	**Vogel et al (2006)**
Ability to customize the learning path	**Vanbecelaere et al (2020)**

Ability to automatically adapt game elements such as content, user interfaces, game mechanics or game difficulty to personalize or personalize the interactive experience	**Holmes et al (2018)**
More effective than non-game learning Engage in longer learning More motivated, desirable, helpful learners and teachers	**Bakhuys Roozeboom et al (2017)**
More effective learning	**Wouters et al (2013)**
Educational effectiveness	**Sitzmann, (2011)**
Learn more science at all levels of education	**Tsai & Tsai, (2020)**
Increase learning in math lessons	**Tokac et al (2019)**
Increase learning	**clark et al, (2016)**

Table 4. Summary of Negative findings

Prevents defeat, challenge and learning players in specific areas of the game	**Chase et al (2021)**
Negative effect on the relationship between mental load and the effect of learning	**Cowley et al (2014)**
Increased mental load, a negative impact on learning in general	**Cowley et al (2013)**
More effective and engaging traditional education	**Sitzmann (2011)**
Increased female anxiety in using a scoreboard that shows the superiority of men.	**Albuquerque et al (2017)**

Table 5. Summary of Effective factors

The small role of predicted pleasure in students' desire to learn with serious games Expect students to find learning games easy and informative Explicit learning tasks, training and in-game support or completed by teachers Children enjoy a learning game based on their motivation to continue engaging with the subject being taught Activation of children's previous knowledge The software has good scaffolding functions	**Iten & Petko, (2016)**
Feedback is one of the most important interventions to improve the acquisition of skills and knowledge and to a lesser extent in-game performance	**Wouters and Oostendorp(2013)**
Supports accurate interpretation of children's play performance Get the kids to try again Provide descriptive feedback	**(Vasalou et al, 2021)**
Increasing the learning efficiency of students trained in adaptive digital technologies compared to non-adaptive digital technologies	**Debeer et al (2021)**
Points, leaderboards and levels	**Rojas et al, (2016)**
Learn more in group participatory games than in individual ones	**Lee et al, (2021).**
Narratives in the game	**Clark et al., (2016)** **Novak, (2015)**
Avatar	**Ratan, et al (2016)**
Traditional supplementary training (without games) in training with games	**Sitzmann, (2011)**
Do not use additional training	**clark et al (2016)**
Group game rather than individual game	**Wouters et al., (2013)** **clark et al (2016)**
Surprise	**Wouters et al(2017)**
Game duration	**clark et al (2016)**
Active training Amount and number of access to the game Complementary training for the game	**Wouters et al (2013)** **Sitzmann(2011)**
Educational support	***Wouters,. & Van Oostendorp(2013)***
proportion educational games with pervasive features, content, purpose	**Lameras (2017)**
Ease of use and game training	**Iten, & Petko, (2016)**

Discussion

In this research, we have reviewed empirical and meta-analytical articles about gamification in education. We have searched the relevant keywords in Web of Science, Scopus and Google Scholar, and we have studied and reviewed the articles and removed similar articles and articles that were not about the effects and effective factors in gamification and conducted a deep review. We discussed the remaining articles and with the investigations we concluded that the positive results of gamification in education are much more than its negative results and then

we put the effective factors in the improvement and effectiveness of gamification that the articles obtained in table 5.

In the present period, the advancement of technologies has been very fast and this technological advancement has affected many topics, including education, and in this regard, gamification has emerged. The important question is that while gamification is used in education whether it has had an effect and whether it has had a positive effect or not. The present research has been carried out in this regard in the last decade. After reviewing the selected articles, it can be stated; Serious games have been reported mainly in effective education, although some studies have yielded negative results Chase et al (2021), Cowley et al (2014), Cowley et al (2013) (Sitzmann (2011), Albuquerque et al, (2017)). The results of most articles testify to the effectiveness and learning of more students from educational games, so it can be said that the introduction of technologies in education, especially gamification has a positive effect on learning and can solve some problems in learning and facilitate the learning path. It is better to use gamification in teaching to improve learning and teachers should be encouraged to use gamification in their teaching. Fadda et al (2022), lamb et al, (2018), Hsu & Cheng (2021) Cheng et al. (2017) Garneli (2017) lamb et al, (2018) Vogel et al (2006), Vanbecelaere et al, (2020), Holmes et al. (2018), Bakhuys Roozeboom et al, (2017), Wouters et al (2013) Sitzmann, (2011), Tsai & Tsai, (2020), Tokac et al (2019), clark et al, (2016). Now that the results indicate a positive effect of gamification on learning, it is better to factorize Identify the effectiveness of more educational games. In some studies, this important issue has been examined. Iten & Petko, (2016), Wouters and Oostendorp (2013), Vasalou et al, (2021), Debeer et al (2021), Rojas et al (2016), Lee et al, (2021).Clark et al (2016), Novak (2015), Ratan, et al (2016), Sitzmann (2011), Wouters et al., (2013), Wouters et al (2017), Sitzmann (2011) Wouters & Van Oostendorp (2013), Lameras (2017), Iten, & Petko, (2016), using the results of research conducted in this regard helps serious game designers and scholars to design games that have the most positive impact on learning and with training and game design Educational firms should take a stronger step in this field based on the influential elements presented in the researches. The links made in the study between positive findings, negative results, and factors affecting the improvement of educational games used in education also provide a comprehensive reference for experts in this field.

Conclusion

To identify factors affecting the effectiveness and efficiency of educational games, 32 articles were reviewed. In the continuation of this research, considering the effects of gamification on various cases, there are some suggestions:

It is suggested to other researchers to conduct more semi-experimental research on each of these factors and examine their results.

It is believed that education with detailed design and planning it can bring better results and the findings of our research can be useful for educational designers and planners.

Also, this research has examined only valid scientific articles, it is suggested to other researchers to examine other articles and manuscripts and people's experiences in future researches and analyze.

It is suggested to conduct interviews and discussions with people who have used gamification in their education.

Declaration of Competing Interest

The author declares that he has no competing financial interests or known personal relationships that would influence the report presented in this article.

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