**Aalto University
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Gamification in education:

Effects and implications of gamified learning approaches in education

Bachelor's Thesis
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Abstract

Gamification is a concept referring to information systems that utilize typical game-like features in a non-gaming context. This type of system design is increasingly used in several domains of application, for example, in healthcare, business, and education, as it has been shown to have a huge potential in influencing human behaviour. Gamification has gained much attention during the past two decades in the field of information systems science due to the rapid development of technology and the amount of research on this topic is tremendous. In education, gamification has proven itself to be a powerful tool in effectively influencing the learning behaviour and motivation of students.

Although several pieces of research have reported beneficial outcomes of gamified learning, contradicting stances on its usefulness have been taken. The most reported positive effects appear to be increased motivation, improved learning outcomes and better attitudes towards learning. However, many researchers have also pointed out that gamified learning may not be suitable for all learners, which is why negative effects like lowered motivation, anxiety and loss of performance have also been reported. As gamification in education is a relatively young area of research, the theoretical background of its uses and the empirical findings are broadly spread.

This literature review examines the effects and implications of gamified learning in higher education with the aim of providing a critical point of view to its uses. Positive and negative effects are discussed as well as different factors that influence the effectiveness of gamified learning. In addition, gamification is also examined carefully from the modern-day perspective, including points of consideration such as ethical issues and the current state of technological development.

Keywords gamification, education, learning, motivation, information systems

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1 Introduction

One phenomenon induced by the rapid technological development of the past decades and the increased use of technology in everyday life is gamification. Gamification is a concept referring to information systems that implement game-like features in a non-gaming context. This type of system design is increasingly used in several domains of application, for example, in healthcare, business, and education as it has been shown to have a huge potential in influencing human behaviour (Dichev & Dicheva, 2017). One example of gamification in the healthcare industry is the development of health and wellness applications, such as those found on some smart watches. There the users are encouraged to exercise by rewards like achieving virtual badges or reaching new levels as they progress, thus making healthy behaviours a 'game'. Another non-academic example could be the language app Duolingo that inspires learning new languages with similar features such as those mentioned earlier. Already these two examples demonstrate how diverse practical uses and implications gamified information systems may have.

Gamification as a term was brought up already in the early 2000s, but the concept did not gain markable attention until the year 2010 – after which the number of research on the topic exploded (Hamari et al., 2014). The research has largely centred around the uses of gamification in education due to its promising positive effects on learning and motivation of students. One of the reasons for this sudden popularity especially in the educational context is the general increase of human-computer interaction (HCI) at schools and the integration of information and communication technologies (ICT) in educational processes. Other reasons include that the attention span of students is increasingly getting more limited, as social media and other technological applications tend to be more intriguing, which is why new methods to get students engaged and motivated to learn are becoming more valuable in successful education (Oliveira et al., 2021). From the modern-day perspective, this developmental line combined with the emergence of the COVID-19 pandemic have naturally only further induced the acceptance of e-learning platforms and online learning and, in general, supported the utilization of gamified learning applications in education (Burlacu et al., 2023).

Usually, gamifying education in practice means that learning activities, such as participating in classroom discussions, practicing problem solving or revising course content, are targeted with different gamified learning approaches in order to motivate specific behaviours or induce certain learning outcomes (Dichev et al., 2020). Despite the large amount of research and high expectations laid on gamified education, there is

still controversial evidence of its effectiveness in enhancing teaching and learning. Gamification may be effective in inducing and improving some learning outcomes, but it has also been highlighted that there are some limits to its usefulness in educational settings (see e.g., Khaldi et al., 2023).

Therefore, this thesis aims to offer a glimpse of the current status of research on gamification in education and take a critical stand on the benefits of using this approach in teaching and learning. It could be argued that as in several countries, for example in Finland, technology is increasingly incorporated into learning processes and the school environment, assessing the benefits and limitations of these practices is essential in successful education. By assessing the positive and negative aspects of implementing gamified learning approaches in education, learning processes and the related information systems can be further understood and improved to answer the demands of the learners of the technocentric modern day.

1.1   Research questions and scope of research

This thesis will be exploring the aspects revolving around gamification in education. The aim of this research is to answer the question *to what extent does gamification enhance learning in education*. As supportive research questions this thesis will also explore the questions *what are the effects of gamified learning approaches in education* and *what factors influence the effectiveness of gamified education on learning outcomes*. As most of the research is conducted in the context of higher education (Alshammari, 2020), this thesis will also focus on the issues of gamification in higher education. However, when discussing the generalizability of research findings on gamification, the perspective of lower educational levels will also be introduced.

1.2   Methodology

The research method for this thesis is literature review. The research collected for this thesis was derived from the Scopus database. Searching from the database (from titles, abstracts and keywords) with the following query yielded in 4,981 document results published during the years from 2011 to 2023: TITLE-ABS-KEY (("gamification" AND "education") OR ("gamification in education") OR ("gamifying education") OR ("gamified education")).

The articles included in this thesis were chosen based on the perceived relevance and quality of the article's content to the objectives of this research. This means that studies that did not contain any elements of education on any level (i.e., primary,

secondary, or higher educational level) or where the link between education and gamification was not clear or direct enough were excluded from this research.

As many of the approximately 5,000 articles on gamification had relatively similar findings (e.g., gamification resulted in improved motivation, better academic performance, experiences of enjoyment) and the topic was studied in similar contexts (e.g., medicine, engineering), studies that were perceived to have a unique viewpoint to the topic of this thesis were subjectively prioritized and selected. The eligibility of each study was evaluated by carefully reading their titles and abstracts. For example, studies discussing the uses of artificial intelligence (AI) chatbots or such tools in the school context were excluded if there was no gamification elements incorporated in the learning process or the link to gamification was weak – although an HCI approach to learning would have been apparent and the reported learning outcomes positive (see e.g., Wu & Yu, 2023).

The articles chosen for this thesis were academic research papers mainly published in peer-reviewed journals. A few were also published in conference proceedings and book chapters. All the articles were written in English. Many of the articles were chosen based on the list of most cited articles (e.g., Dichev & Dicheva, 2017; Domínguez et al., 2013; Koivisto & Hamari, 2019), but majority for the relevance of the article's content. Additionally, studies published relatively recently were prioritized in this research. This was because the area of research is developing at a tremendous pace and gamification has changed its form quite much from the beginning of research until to this day, which is why the latest research provides a better viewpoint of the current state of gamification.

As the amount of research conducted on this topic is huge considering the scope of this thesis, it is possible that some important pieces of research may have been missed and this has been acknowledged in the discussion section of this thesis.

1.3 Structure of the research

In Chapter 2, the definition of gamification will be discussed after which some of the theoretical frameworks explaining the practical implications of this concept will be introduced. In the following chapter the contradicting research findings regarding gamified education will be introduced, which leads to Chapter 4, where several factors that influence the effectiveness of using gamification approaches in education will be pointed out. In Chapter 5 the findings of the research will be discussed. In Chapter 6 a concluding summary of the findings based on the discussion will be given.

2 Defining gamification in education and introducing its theoretical background

In this chapter, the concept of gamification will be explored and defined thoroughly in the context of education. After defining gamification, the major theoretical framework explaining its uses in educational purposes will be introduced.

2.1 Definition to gamification

Despite the great number of research, there is still variation in how gamification is defined in the literature. As the concept combines several theoretical frameworks, technological domains, and empirical evidence in practice, it has been difficult for the scientific community to form a consensus over its definition (Dichev & Dicheva, 2017). For example, some authors prefer a distinction between game-based applications, serious games, and gamification (Karagiorgas & Niemann, 2017; Krath et al., 2021), while some consider gamification as an umbrella term for all cases where game-elements have been applied in a non-gaming system (Seaborn & Fels, 2015). On the other hand, some definitions differ in the way what is emphasized; the focus can be on the purpose of gamification or on the specific design of the system (Lam & Tse, 2022).

A relevant issue in defining gamification is the definition of game-elements. In several studies (see e.g., Dichev & Dicheva, 2017; Khaldi et al., 2023; Krath et al., 2021) the aspects of points, badges, instant feedback and leaderboards are considered as the classical and essential game-elements in a gamified system, but some more advanced elements are sometimes included in this list as well, such as challenges, storytelling, cooperative elements, and virtual characters. On the other hand, some scholars have questioned which aspects can even be counted as purely game-elements as each of the previously mentioned elements can also be found in non-game contexts. The perception of these can also differ extensively between the end-user and the designer, which also influences the full definition. Additionally, as none of these elements would be considered as "gameful" or "game specific" when isolated from the gaming context, it further demonstrates how difficult it is to define game-elements in a general manner – which then reflects to the issue of defining gamification. (Deterding et al., 2011.)

Nonetheless, it appears that a common aspect of the different definitions is the idea that implementing a game-design to an educational information system is intriguing and engaging to people, which allows for easy and effortless learning. Game-design in this context means any form of play where computer technology is involved in creating a joyful and fun user-experience and this seems to be the main reason why gamification is

considered a useful system design in so many different contexts, especially in education (Karagiorgas & Niemann, 2017; Koivisto & Hamari, 2019). Another unifying factor seems to be the shared idea that in practice basically any information system can be gamified by adding some game-elements, which makes it more approachable to people and the learning more self-driven (Nair & Mathew, 2019).

As gamification is a complex and multidisciplinary concept, in this thesis it is understood in a relatively general manner that appeared in most of the papers reviewed for this thesis (e.g., Deterding et al., 2011; Dichev & Dicheva, 2017; Khaldi et al., 2023; Koivisto & Hamari, 2019). In this thesis gamification is understood as the use of 'game-elements' in a technological non-game application, with the attempt to create 'gameful experiences' to guide and enhance learning processes. Game-elements are considered to include the whole range of features that generate the game-like user experience in the educational information system, such as point systems, score boards, virtual environments, and challenges. Additionally, the user experiences discussed in this review refer to learning processes experienced either on an e-learning platform or online learning environment i.e., individual learning experiences online or interactive and teacher-led learning experiences with the gamified system.

2.2   Theories applied in gamification research

Due to its multidisciplinary nature, gamification has attracted a range of different theoretical frameworks explaining its potential to enhance learning. In a recently published systematic meta-review, Krath et al. (2021) found that scholars have used a total of 118 different theories in explaining how gamification works, i.e., how gamification helps in achieving desired effects in the behaviour of a learner. In their study, these effects were subjectively divided into three categories: motivational and affective, behavioural, and learning effects to categorize the research results. According to their findings the most used theory explaining gamification was the Self-determination theory (SDT); a motivational theory that was mentioned in a total of 82 papers included in the review. This theory was also mentioned in several of the studies included in this current review (e.g., Khaldi et al., 2023; Manzano-León et al., 2021; Zainuddin et al., 2020) and it is often closely associated with other motivational theories due to its exceptional nature of being generally applicable in many different contexts (Nair & Mathew, 2019).

SDT considers that the motivation of an individual to act is dependent on intrinsic and extrinsic motivational dimensions. Intrinsic motivation refers to activities that an individual does for personal satisfaction and enjoyment while extrinsic motivation refers

to motivation induced by external factors, like rewards. According to the theory, intrinsic motivation is superior to extrinsic motivation because it tends to fulfil the three basic psychological needs of an individual: feelings of competence, relatedness, and autonomy. In simple terms, the theory suggests that when a task provokes these three aspects in a learner, it maintains or enhances intrinsic motivation, which facilitates goal-oriented behaviour better than what extrinsic motivational factors can. In fact, the feature of combining motivation, individual growth and wellness is one of the reasons that has made SDT such a popular theory in the field of gamification research. (Deci & Ryan, 2000.)

Other theories that were most frequently mentioned in the review by Krath et al. (2021) were the Flow theory (number of studies using the theory was 47) and Experiental learning theory (40). Flow theory explains that once people get extremely engaged in what they are doing, they will reach a "flow state" in their mind, which then promotes intrinsic motivation to further pursue and complete an activity instead of just doing something to achieve a goal (Csikszentmihalyi, 2014). Considering the engaging nature of games, it seems rational to expect that a gameful design of a system enhances in reaching this "flow state". Experiential learning theory in turn emphasizes that rather than acquiring knowledge through direct instruction and repetition, personal and environmental experiences play a crucial role in constructing an individual's knowledge (Kolb, 2014). Experiental learning theory combines several other learning theories, like social constructivism and constructivist learning theory, and as game-based learning is often relying on learning by doing (Koivisto et al., 2017), it makes Experiential learning theory applicable and well-used theory in the context of gamification.

One common factor of these theories is the connection between motivation, and more specifically, intrinsic motivation of an individual and successful learning. Other, less frequently mentioned theories, in the study by Krath et al. (2021) appear to also have a motivational dimension incorporated in their explanation, although the focus of the theory itself would be different (e.g., Social Cognitive Learning Theory (SCT), Theory of Planned Behaviour (TPB), Goal-setting theory). However, as pointed out by the authors, often the theories used to explain the function of gamification share psychological mechanisms that are explained in more general terms rather than in specific situations (Krath et al., 2021). This means that the theoretical framework is rather open-ended and not clearly tied to the context of gamification. In addition, there are notable unifying relationships between the different theories, which in turn further demonstrates how there is no general theory explaining gamification – rather a combination of frameworks

that work together to answer the questions of "how" and "why" gamification is useful in enhancing learning processes (Dichev & Dicheva, 2017).

Nonetheless, it must be highlighted that despite the range of theoretical frameworks explaining the usefulness of gamification, the actual information system design may not be grounded on any of these principles in practice. In their recent literature review of a total of 90 articles on e-learning and gamification, Khaldi et al. (2023) found that only a few articles of applied gamification tended to use theoretical frameworks in designing their learning systems. It was pointed out that although psychological and educational theories, such as those discussed above, have been used as a supporting background for gamification, there is no rationale or explanation for choosing some elements over others in designing the resulting system. This means that there is a lack of consistency in the theoretical framework and the ways systems are designed, which suggests that research findings on this area may be incomparable and difficult to replicate. However, this will be addressed later in this review when discussing the findings of the current review.

Nonetheless, similar to the findings of Khaldi et al. (2023) the questionable relationship between the research and theory behind gamification have been reported also by earlier research: the desired behavioural changes resulted by gamification are still more about guessing than science (Dichev & Dicheva, 2017). This may be due to the fact that expectations towards the learning outcomes of gamification are most often way too optimistic because of the general hype over new technology and the relative pressure to publish on the new field of research. In practice it appears that the main reason to gamify educational information systems is based on a gut feeling that incorporating elements similar to games will create a similar user experience as playing actual games. The underlying belief is that a game-design will engage learners to actively participate in the learning experience, which is the key to reach better learning outcomes compared to more traditional teaching methods (Dichev & Dicheva, 2017; Koivisto & Hamari, 2019). However, as it will appear in Chapter 3, this assumption may not always lead to positive learning outcomes.

It can be established by now that the theoretical footings of gamification are diverse, and this may be part of the reason why it is also possible to apply this type of system design in so many different contexts. It must also be noted that naturally the range of theories explaining the uses of gamification continue outside of the ones mentioned in this thesis. The range of theories indicate that the field of research is still relatively young, and it has

great potential to be expanded in several areas of science, developed and synthesized along with the increasing amount of literature.

From the perspective of education, this complex feature of gamification implies that it is relatively difficult to predict what practical benefits and limitations of gamifying education will have since these theories offer so many different perspectives to the topic. However, one combining feature of the theories is the basic assumption that gamification can influence certain attitudes and behaviours in a learner, which at its best can enhance and improve learning outcomes. Similarly, the basic assumption in this thesis is that gamification can enhance learning and motivation. Nonetheless, in the following chapter the contradicting research findings on gamified education will be introduced and discussed to reassess these assumptions.

3   Contradicting research findings of gamified education

In this chapter the contradicting research of the learning outcomes of gamified education will be introduced. The chapter is divided into two sub-sections, examining first the positive and then the negative findings of research. The purpose of this chapter is to introduce and explore the impacts and effects of gamified education and provide a critical viewpoint to the benefits of using gamification strategies in education.

3.1   Positive effects of gamification on learning outcomes and motivation

Already in the early state of empirical research on gamification, the beneficial outcomes of its implementation in education have been recognized and promoted by scholars (Hamari et al., 2014). In fact, it has even been suggested that gamification should be considered as a new educational theory among the four traditional theories of behaviourism, cognitivism, constructivism and connectivism (Bíró, 2014). Most of the studies that research the psychological outcomes of gamification often focus on motivational and attitudinal aspects, although specific effects like learning, attainment and participation are often analysed as well (Dichev & Dicheva, 2017). The reason why tools, like gamified learning applications, to enhance and maintain especially the motivation of students have been the target of interest among researchers is that motivation is one of the key predictors in achieving successful academic outcomes (Linehan et al., 2011). Therefore, it is not a surprise that the theoretical potential of enhancing learning by gamifying education has been extensively studied.

The findings of the review by Koivisto and Hamari (2019) that categorized over 800 and analysed in detail 273 different empirical studies imply that the entertaining nature of gaming makes the learning situation itself less serious and pressured for students than what traditional teaching methods do, which may lead to students feeling more confident and comfortable in learning new things. The researchers suggest that the hedonic features i.e. the experiences of enjoyment and "fun" would make students become more open to making mistakes and learning from them in a good spirit, which explains why gamification may lead to better learning outcomes and increased motivation to learn than traditional teaching methods (Koivisto & Hamari, 2019). It could be argued that in the modern world where especially younger generations are digital natives – meaning people who have grown up with digital and information technology integrated in their living – gamified learning approaches is rather a new normal than utopistic educational

vision of technocentric people. This is why it could be considered to be more effective in enhancing learning in the present and the future than, for example, at the time of first pieces of research on gamification.

These ideas could be considered to be in line with the findings of recent empirical research. For example, a popular quiz-like game application Kahoot! has shown to increase the interest and ambition of students to reach out for successful academic achievements (Bicen & Kocakoyun, 2018). Kahoot! is one typical example of a gamified learning environment used in the school context as it includes the aspects of scores and leaderboards as well as the features of instant feedback, ease of use and socialization. Bicen and Kocakoyun (2018) found that the competitive learning environment of Kahoot! increased the motivation of the undergraduates studying pre-school pedagogy. They were more motivated to improve themselves in the course topics they were not that strong on yet, and the implementation even encouraged them to study before arriving in class. Additionally, according to the student interviews, this hybrid learning method – meaning, learning through the combination of technological and traditional instructor-led methods – helped them to learn topics that were difficult to understand better than with traditional methods.

Another recently published study assessing the use of Kahoot! in classroom environment reported similar findings: the gamification dynamics helped in the assimilation of course content and resulted in improved exam performance of students (Bienvenido-Huertas et al., 2023). It was also found that the proportion of students who failed the exam was lower than the failure percentage of the previous academic years, and the number of higher marks achieved by students increased. This further supports the theoretical assumption that gamifying learning may enhance and improve academic performance, maybe even better than traditional methods. Additionally, as this study reported positive learning outcomes in the context of learning difficult content of building and architecture engineering, the findings also demonstrate how gamification can be successfully applied in several subject areas of education.

It appears that especially when gamification is made *meaningful*, such as using Kahoot! -like interactive gaming environment in revising course content, these types of positive effects, where students report gaming applications as engaging, fun and interesting, are produced (Tan, 2018). It will more likely lead to positive learning experiences even on subjects or assignments that are found intimidating or boring. For example, Tan (2018) implemented a game utilizing a virtual environment and quiz elements in a university level writing module. The aim of the study was to motivate and assist undergraduates to

improve their academic writing. It was found that gamifying the activity of reading the course material prior to classroom discussion helped the students to scaffold the difficult content of the writing module, deep-understand and internalize the content of the readings better than what traditional methods had previously done. It was also reported that experiences of failure did not appear among the students although correct answers were required in the game, and that even a few technical issues did not influence the students' engagement to the extent that the learning experience was harmed. Tan (2018) considered that because the gamified approach was meaningful from the perspective of students and in terms of the learning goals, it had a successful outcome.

Interestingly, sometimes gamifying learning may be the key factor in inducing positive learning experiences and successful learning outcomes – especially in the context of online learning. Aparicio et al. (2019) found that in the context of massive open online courses (MOOCs) gamified system design was the most important driver to induce greater participation and engagement of students, thus prompting better learning outcomes. MOOCs are a type of online courses designed to make education across subjects accessible and affordable for thousands of people at once and enabling effective knowledge sharing using digital channels. Aparicio et al. (2019) reported that when the learning experience of MOOCs was gamified, it induced learners to take an active role in course tasks, which in turn had a positive influence on usage rates of the system and improved learning outcomes.

In addition to the previously mentioned findings, gamification has yielded fruitful results in several other standard school subjects as well as in science, technology, engineering, and mathematics (STEM subjects). For example, Ivanova et al. (2019) studied the uses of gamification in the context of software engineering with interesting findings. In their experiment they implemented a range of different educational games (e.g., Kahoot, Code Combat, The Millionaire Game) with the aim of teaching software methodologies efficiently and effectively to undergraduates. What they found was that during the study almost half of the students (44,8%) reported that they achieved remarkably better results during the course than what they had expected and 39,5% reported they were satisfied with their learning outcomes. In addition, several students revealed that the gaming activities of the course had a significant positive influence on their interest and motivation to learn. These findings are significant in the sense that because software engineering is a difficult field of science with demanding courses, utilizing gaming methods to enhance intrinsic motivation and foster positive attitudes towards learning is even more valuable to prevent, for example, unnecessary dropouts or academic overwhelm. Students are also more likely to keep up with their studies and experience

genuine joy from the learning process itself if it feels rather easily approachable and fun than overwhelming and difficult.

All in all, findings similar to those reported above have been reported in a range of other studies. Legaki et al. (2020) found that challenge-based gamification implemented in the context of learning statistics produced positive learning outcomes in comparison to traditional methods. Although it was observed that gamification in combination with traditional method like reading produced the greatest effect, still by only incorporating some gaming mechanics in a system used during the lectures was beneficial for students. Koivisto et al. (2017) reported that online 3D simulation game was useful in the context of nursing students' education because they were able to gain practical experience of real-life situations of hospital environment in a safe virtual environment. This appeared to increase engagement and reduce school stress experienced by the students. Yang et al. (2023) implemented Artificially Intelligent Educational Robots (AIERs) in a laboratory safety course and it was found that this gamified learning tool improved significantly students' learning motivation, learning achievements, problem-solving skills, and even reduced their cognitive load of learning in comparison to a control group. In addition, the workload and stress experienced by the instructors were reduced as they were substituted with the robots that even produced better learning outcomes than what teachers had produced.

Recent research has even found positive findings of gamified learning approaches in special education. Hussein et al. (2023) found in their literature review that a gamified learning approach has been effective in enhancing the skill development and learning skills of individuals with a disability. It was considered that gamification approaches to learning encouraged special individuals to participate in learning activities better than traditional methods, which facilitated their engagement and enjoyment of education. It was also noted that gamification also promoted positive attitudes towards learning in general among the students. This piece of research is especially remarkable in the sense that its findings demonstrate how gamified learning methods can increase the availability of education and enhance the learning processes even in expensive special education, where unique learning strategies to facilitate learning and skill development of these special individuals is essential.

3.2 Negative effects and implications of using gamification approaches in education

Although inarguably positive effects of gamified education on motivation and learning outcomes do exist, to some extent the research findings of these effects may be due to confirmation bias, issues regarding self-reported data or other factors that will be discussed more in Chapter 4. For instance, in their literature review Hamari et al. (2014) found that all the reviewed articles reported positive user experiences of gamified learning systems, such as better engagement and increased enjoyment of learning. However, alongside it was also noted that these very same aspects that created the positive effects were also the ones most disliked by some of the participants, which eventually had a negative impact on their motivation and engagement. This contradictory situation was similarly observed in a study by Domínguez et al. (2013). They found that although aspects like reward systems and leaderboards had a positive motivational effect on students, many of them did not find this motivating enough to increase their course participation. In fact, some students found the gamified system in turn discouraging as they did not like competing with their classmates. These aspects demonstrate one of the issues of gamifying learning that will be discussed more in Chapter 4: gamification approaches in education are not something that fits all students.

Nonetheless, lowered motivation appears to not be the only negative effect of gamification. Toda et al. (2018) conducted a systematic mapping study of the negative effects resulted by gamified system designs. What they found was that the loss of performance was the most occurring negative effect of gamification, followed by undesired behaviour, indifference, and declining effects on learning. It was reported that the loss of performance could be the result if gamification harms the learning process, the system produces unmotivating effects or if the rules or instructions are not understood by the learners. Undesired behaviour in turn was the result of poor planning, or rather the absence of it, in the learning context.

Hanus and Fox (2015) had also contradicting results of the usefulness and effectiveness of gamification on learning outcomes in their experimental research. In this longitudinal study students were separated into two groups that studied the same course, but while the other was taught with traditional teaching methods, the other one was a "gamified course", where participation, completion of badges and engagement with an online leaderboard was required. Unlike predicted, the common features of gamification, namely competition, badges and leaderboards, that were used in the gamified group were observed to be harmful: motivation, satisfaction and empowerment of the

students were shown to decrease in comparison to the non-gamified group. Although the gamified course was designed based on the objectives of promoting student motivation and learning engagement, these students were less intrinsically motivated and even achieved lower exam scores in comparison to those in the non-gamified group.

Taking the findings of Hanus and Fox (2015) to another level, Chan et al. (2018) concluded in their experimental study that highly motivated students may not need gamification at all to enhance their learning. In contrast, gamified approaches, such as including leaderboards in the learning environment, can have an opposite, negative effect on motivation. The authors initially suggested that since gamified learning systems often designed to give instant feedback, with a point system or some other way, students would be intrinsically more encouraged to push forward their learning process than with traditional methods. Instead, based on their findings, it was argued that when there are no leaderboards or granting of points, students will rather "adopt the mastery goal over the performance goal" as the overall performance is not assessed. This in turn promotes better learning outcomes and academic performance than by having those game elements integrated into the system (Chan et al., 2018). From the perspective of gamification, this implies that traditional teaching methods with their comprehensive assignments would be all in all superior as students are therefore able to focus on a single goal and work towards that rather than managing with multiple goals simultaneously.

Recent research findings also support these undesired effects of incorporating game-elements in education. Almeida et al. (2023) conducted a systematic mapping of 77 studies reporting negative effects of gamification on learning and they found that especially badges, competition, leaderboards and point systems are the most influential aspects causing the adverse effects among students. Their findings seem rational in the sense that these elements tend to create a competitive learning environment, which was already highlighted by Hamari et al. (2014): competition is often liked by one and disliked by other. The researchers also noted that competition is often linked with the ethical issue of cheating, which also appeared to be one of the negative effects reported by students. It is easier to cheat in an online environment and more tempting when there is there is the aspect of gaining points or rewards involved. All in all, most of the negative effects of gamified learning experienced that were reported by Hamari et al. (2014) were the lack of effect (number of articles was 16), lack of understanding (9), irrelevance (8) and lack of motivation (8). In other words, the most commonly gamified learning approach did not produce any different results in comparison to traditional methods,

which offers a critical viewpoint to the research prompting the benefits of gamified education.

Other recently published studies have only further questioned the effectiveness of gamification approaches to learning with their findings. Kirsch and Spreckelsen (2023) found no evidence of e-learning methods improving medicine students' intrinsic motivation or learning outcomes, although most students reported enjoyment of the gamified learning process. In contrast, the students specifically rejected the competitive approach to learning and aimed at spending the minimum time on the learning process. Similarly, Batlle Rodríguez and Vicenta González Argüello (2023) found that university students learning Spanish showed progress in learning the vocabulary with a gamified learning tool, but there was no significant improvement grammatical knowledge. This in turn implies that gamified learning approaches may only induce some surface-level learning processes, such as memorization, but not the processes of gaining deep knowledge or deep understanding of concepts in the long run – at least in the context of language studies. Other noteworthy aspects reported by research are that courses utilizing online learning or e-learning platforms often have high dropout rates (Aparicio et al., 2019) and low course completion rates (Khaldi et al., 2023), which further implies that gamification approaches may not be as effective as promised or at least not suitable for all learners.

While several pieces of research, such as those discussed earlier, criticise the effects of gamified education methods in terms of direct influence, like lowered motivation or lowered participation, very few tend to acknowledge the potential risks and adverse impacts involved with implementing these systems in schools. Al-Msallam et al. (2023) addresses this research gap by taking an interesting stand to gamified education with their study regarding ethical issues in gamification. Their research highlighted various concerns, for example, unavoidable information risk, privacy issues regarding gamification servers, organization and systems, possible discrimination, manipulation, psychological stress, and addictive behaviours. Especially in the modern-day where, for example, disinformation is cruelly spread – consider, for example, the education in Russia manipulated by the government – it could be argued that these systems can at worst produce long-term negative effects that are harmful regardless of factors, such as age or educational level. This poses a question: why should these information systems be more integrated into education if, according to the studies presented, minimal to no effect is produced in comparison to traditional teaching methods, but the negative effects

may result in adverse situations like increased polarization or discrimination in the larger scale?

It could be argued that the negative effects, especially those noted by Al-Msallam et al. (2023), regarding gamification in education are just about to burst as the research area is maturing. This is supported by the fact that still, after more than 10 years of research on gamified education, most studies seek for and report about the beneficial outcomes of gamified approaches to teaching and learning rather than its adverse effects. This implies that most likely researchers will turn their focus on these negative effects and implications of gamification in the near future. As technology is even more advanced today than it was in the early 2010s, it poses threats and risks that may not even be considered of yet.

4 Factors influencing the effectiveness of gamification approaches in education

The majority of studies in the earlier years of research on gamification tend to focus on the question *does* gamification work rather than *how* or *why* does it work (Dichev & Dicheva, 2017). More recent research has addressed this gap by paying attention to the aspects that have an impact on the effectiveness of gamified learning, such as personal characteristics and contextual factors (Luo, 2022). In this chapter, these different factors will be introduced and discussed with the aim of gaining more insights to what should be considered when implementing gamified systems in education.

Design of the system

As already implied in the previous chapters, one seemingly obvious factor influencing successful gamification is the system design of the gamified learning tool. However, research on proven successful gamified learning approaches is not consistent or comparable with one another in this sense, which has made the work of gamification designers difficult and consequently led to unpredictable user experiences. Additionally, consensus over appropriate game-elements and understanding their contribution to the system is non-existent. (Dichev & Dicheva, 2017; Khaldi et al., 2023). This implies that understanding the connection between technology, user-experience and learners' needs is still limited and requires more future research efforts.

If the system is easy to use, approachable and stimulates active involvement of the user, it most likely has the capability to enhance learning outcomes (Luo, 2022). Blanco et al. (2023) found in their experimental study in the context of software engineering that especially the *experience design* is the key to succeed in gamification. The authors considered that the motivating effects should be distributed along the gamified learning process to maintain the engagement of students from the beginning until the end. Based on their findings, the authors concluded that well-designed gamification increases engagement, which simultaneously leads to better academic performance. This is in line with the arguments of Antonaci et al. (2019) in their literature review: game-elements chosen for a learning system should be made *meaningful* to the students to enhance their learning and not just some superficial visual aspects with no concrete effect on the learner.

An issue relevant to the gamification experience is that most gamified learning applications tend to assume that all learners share homogenous characteristics, meaning that all system users are expected to be similar to one another (Khaldi et al., 2023). Consequently, this has been reported as one of the major reasons why gamification

projects typically fail because it dismisses the impact of individual characteristics on the effectiveness of gamification. Nonetheless, this notion has most likely led to the modern developmental line of making the gamified system design more personalized in terms of the students as it is rather naïve to assume similar characteristics of all users.

Personal characteristics

It is interesting how only until very recently the impact of personal characteristics has gained more attention among researchers and system designers, although already some time ago the influence of personality on the perception of gamified learning tools have been noticed. For example, Buckley and Doyle (2016) found that gamification elements of leaderboards, ranking systems and "inherent uncertainty of forecasting" that create a gambling-like learning environment are especially effective for individuals who find themselves competitive. The experiences of competition and uncertainty can excite and motivate students that are ambitious and desire competition, which in turn induces better engagement in their learning process.

Recently published research also supports these findings as Rowicka and Postek (2023) reported that one powerful factor influencing attitudes towards learning is the feeling of competence – which successful performance in a competitive gaming environment can enhance at its best. On the contrary, some students might experience competition uncomfortable, which then influences their user experience and learning outcomes. This means that personality differences do have an impact on how gamification is experienced and how it can influence learning positively or negatively.

In a another recently published study the connection between the personal characteristics of students, their actions and a gamified learning system was examined with interesting findings. Smiderle et al. (2020) conducted a four-months long experiment on students' learning how to program, and they found that gamifying the learning processes had distinct impacts on the undergraduates' learning outcomes based on their personality traits. It appeared that those participants who identified themselves as introverted had better learning outcomes than those who identified as extroverted. The difference between the results of these students with different personality traits was statistically significant. Introverts were also more engaged on the assigned tasks than extroverts, which further implies that the gamified approach was more beneficial to their learning process. Additionally, the authors also found that those students in a gamified group with low conscientious personality did not experience reductions in their level of accuracy in the assignments unlike students in the non-gamified group, which in turn implies that a gamification approach may help this former type of students better in

reaching their learning goals. On the other hand, these findings further support the idea that gamification may not be suitable for all types of learners.

Earlier research has also suggested that there are differences in the perception of gamification approaches depending on age and gender. One typical assumption has been that males find gamified systems more intriguing and engaging than females, thus making it more effective learning method for them (Hamari et al., 2014). Interestingly however, recent research has reported that gender does not influence the attitudes towards gamification or the perception of gamified learning tools, and that demographic factors in general appear not to influence to a significant extent the perception of gameful experiences in education (Palmquist & Jedel, 2021). This contradiction between the findings demonstrates how in general research on the factors influencing the effectiveness of gamification is crucial because faulty assumptions made of the possible user, such as assumptions based on gender or other demographic factors, have an influence on the system design. This, in turn, may lead to adverse effects like discrimination and psychological stress.

Contextual factors

Contextual factors have also been acknowledged to influence the effectiveness of gamification. Hamari et al. (2014) defined that context in relation to gamification refers to the main service or the activity that is gamified. This implies that just by incorporating game mechanics into learning activities is overly optimistic, if improved motivation or learning outcomes are desired, because naturally the students have different motivations, skills, and goals in their educational path, which should be considered prior to using gamification approaches in education, and all learning processes may not be suitable to gamify. Dichev et al. (2020) addressed this latter notion by proposing a typology to group learners according to their relative motivators, perceived abilities, and the educational context. They considered that matching the learner types of students – meaning, the way one can personally acquire new information the best, i.e., visually, auditorily, kinaesthetically, through reading or writing – and their motivational affordances could facilitate the personalization of gamified learning tools and better induce the positive effects of gamification.

The findings of Buckley and Doyle (2016) support these ideas as well; they found that students with different types of motivation experience the effects of gamification differently. Those who are intrinsically motivated to learn get the most use out of gamified learning environments. In a latter study by the same authors it was also highlighted that the effects of gamification are experienced differently by students with

different learning styles (Buckley & Doyle, 2017). These two points highlight how gamification should be carefully implemented depending on the contextual factors.

Kam and Umar (2022) in turn found that gamification can be more useful to students depending on their achievement level. Although gamification did not have an influence on the competence of students with different achievement levels, it was found that low-level achievers benefitted more from the gamified learning approaches than high-level achievers, meaning that it improved their learning outcomes. It was suggested that the features of badges and leaderboards raised the interest of the low achievers, which resulted in positive learning experiences. This could be considered to be in line with one of the findings of Chan et al. (2018) that highly motivated students may not need gamification approaches at all to enhance their learning process, because they already have the intrinsic motivation to learn.

Student-teacher relationship

One factor that may have not gained as much attention as necessary is the impact of the student-teacher relationship on gamified learning experience. An experiment conducted in the context of online higher education found that gamified learning may not be as appealing as assumed, but the student-teacher relationship is highly influential, especially in online education (Torrado Cespón & Díaz Lage, 2022). Torrado Cespón and Díaz Lage (2022) stated that "gamification should not be everywhere and above all" – rather designed in terms of the learners.

5 Discussion

In this thesis, a literature review was conducted to examine the extent to which gamification approaches in education can enhance learning. The amount of empirical research on this topic is huge, which is why it is possible that some important pieces of research may have been missed. However, studies reporting positive and negative effects and implications of gamification was examined as well as some of the factors influencing the effectiveness of gamified learning. Adverse effects of integrating technology in education, such as information security risks and ethical issues, were also discussed to understand the whole range of implications of gamification in education.

5.1 Implications to research

Most of the research in this review reported positive findings of gamified learning. The majority of these were improved learning outcomes, better skill acquisition, increased engagement, feelings of enjoyment and overall better learning experiences. However, many of the studies also pointed out negative attitudes towards gamified learning approaches and its contradicting effects on learning, which demonstrates the controversial nature of gamified learning. Students may enjoy the learning experience of a gamified learning tool, but it may not produce any learning effects. The findings of the current review imply that recently more critical stands have been taken on the usefulness and effectiveness of gamified learning approaches, which implies that gamification will be implemented more carefully with thorough consideration in the future research.

System design

As highlighted by several scholars, one issue in the whole field of gamification research is still the inconsistent choice of game-elements within a learning system. There is lack of logical reasoning and theoretical backing basing these decisions, which results in unpredictable effects of the information system on learners and inconsistency issues in the research area in general. It is possible that some of the negative effects reported by research, such as lowered motivation, boredom or fatigue experienced by students, is the result of inconsistent theoretical backing and hence improper system design. Rationally thinking it is difficult to implement a learning system successfully, especially in the school context, if the system is based on weak principles or merely a gut-feeling. To strengthen the theoretical framework on gamified learning, more research on the factors influencing the effectiveness of gamification approaches would be valuable for the progress in this research field to shed more light on the issues that should be considered when designing and implementing a gamified learning system.

As noted, the overall theoretical framework of gamification is still relatively vague. The effectiveness of gamified learning approaches has mostly been explained by the Self-determination theory (SDT), which considers that gamification enhances intrinsic motivation that is the superior motivation type in improving learning. Important point of critique on gamification research is that motivation is often measured with point systems, which in practice may not reflect motivation at all. Scoring well in a game may not have anything to do with intrinsic motivation or better learning outcomes, especially in the context of modern-day university studies. In today's higher education, several courses may offer compensation of course credits for completing tasks or participating in a gamified assignment, which is why intrinsic motivation to complete assignments may still be low although points achieved by students would have been high. Another relevant thing to highlight is that nowadays cheating is made relatively easy (consider e.g., the availability of tools like ChatGPT or in general a better access to internet in comparison to the early 2010s), which is why course credits are easy and effortless to get without even paying attention to the learning topics. This poses a problem to research of positive effects of gamification on motivation that have utilized an experimental design; what is being measured may not reflect reality at all.

An interesting point brought up by Hanus and Fox (2015) was that since gamification often includes the aspects of badges or points, they rather encourage extrinsic than intrinsic motivational dimensions. This appears to not be in line with the theoretical foundations of gamifying learning. To continue from the authors' thinking, it could be argued that the common gaming features of having point systems, badges and leaderboards may actually even be outdated in the 2020s, especially with their controversial feature of adding competition in the context of education. It may be that nowadays the digital native students are deeming for more complex systems and that in the individualistic environment the system designs should be more focused on the students as individuals rather than just 'players'.

These arguments are also supported by the conclusions made in the study be Thomas et al. (2023). In their study, interviews conducted with gamified system designers revealed that modern gamification may be shifting from the concept of pure games towards systems that utilize the principles of positive psychology and the concept of metaverse. This means that successful gamified education is built on creating gameful experiences based on these latter principles rather than specific game elements. This offers an interesting new point of view to the study of educational gamification as it implies that possibly features of social simulation games (e.g., games like Sims) would be trending in the near future.

These latter ideas appear to be supported by scholars in the sense that the social side of gamification has been advocated in the more recent research. Based on their findings, Legaki et al. (2020) suggested that increasing the complexity of information systems and incorporating more collaboration between students in the learning tools may be one way to enhance the effectiveness of gamified learning approaches. Similar approaches have also been promoted already by Koivisto and Hamari (2019, p. 204): "[I]nstead of focusing strongly on individual motivation and behaviours, gamification research could also be beneficial in increasing our understanding of how to induce and maintain collective and collaborative behaviours."

Issues with study samples

One problematic finding of this current review is that in several studies the participants are either studying to become teachers themselves (Bicen & Kocakoyun, 2018) or studying something technology-related field of science (Ivanova et al., 2019). The reason for this being problematic is that this background arguably makes them more capable than an average person to understand technological mechanisms and applications, and more motivated to conduct assignments and take an active role as a learner since they have either the advanced skills or external pressure coming from finishing their degree. Therefore, it is rational to assume that research in these contexts yield positive outcomes because the students are more likely to naturally do well. On the other hand, it could also be considered that here gamification is implemented in a meaningful way, which is why positive results are possible.

An example where gamification is not implemented meaningfully is the study by Kirsch and Spreckelsen (2023) in the context of medical studies: although the students enjoyed the gamified learning approach, they still considered it less effective than traditional methods. This could be because they are not training to work with technology similarly like engineers but rather for helping and working with people, which is why bringing some arguably unnecessary aspects to teaching may feel useless. Another reason for this finding could be that the learning system was not designed in terms of the needs of this specific group of learners, which hindered the learning effects. Despite these findings, the research included in this current review tend to implicitly suggest that the positive findings are universally applicable in different contexts independent of the subject or educational level, which may also be one of the reasons why gamification is so extensively promoted in the educational field of science.

Primary and secondary school perspective

When considering the whole educational path of learners, the generalizing attitude to research findings implied by scholars tend to be faulty in the sense that there is a huge gap in the literature of gamified learning in the context of primary and secondary levels of education (Alshammari, 2020). It is strange in the sense that rationally thinking there must be a difference how gamified learning approaches are experienced by an eight-year-old pupil versus a 25-year-old student and how they affect learning.

There are relatively few studies reporting gamified learning approaches in the lower levels of education. Alshammari (2020) reported similarly positive learning outcomes and improved learning motivation in elementary school context as did many of the studies in the higher educational context. Vrcelj et al. (2023) also concluded in their systematic literature review that gamification in primary and secondary education yields positive influence especially on the motivation of students. What was surprising in their research is that no negative effects were reported in any of the studies reviewed. However, Dehghanzadeh et al. (2023) reported in their systematic review that although gamification can result in the above-mentioned positive effects, acknowledgement of personal characteristics, proper instructions and support from teachers and targeted learning outcomes must be more carefully considered in the lower educational levels. The same study suggested on the side that these aspects should be considered in every educational level to achieve successful implementation of gamification.

From these few examples, it could be considered that the effects of gamification in lower educational levels follow the positive trends of higher education, but since children need more tuition and support in their learning process the issues with gamification should be more conscientiously considered in comparison to higher education. However, most likely the research on these lower educational levels will increase in the near future, as it already has been, because incorporating advanced technology in education is more common even in primary schools. Very recently, López-Faican and Jaen (2023) reported in their experimental study that augmented reality (AR) based game improved the empathic abilities of children aged 12-15 years and induced better prosocial behaviour. This implies that the uses of gamification in education may be more diverse in the future than just implementing the basic competitive or visual game-elements into an educational information system. Additionally, future research could study the uses of gamification in learning prosocial behaviour in all age groups as empathy and understanding of other people's perspective has become ever more valuable.

5.2 Implications to practice

Gamification has a range of positive practical implications in the educational context, and these are not limited to the beneficial effects it has on learning outcomes and motivation of students. Positive findings have been reported in a range of different educational contexts, such as engineering (Ivanova et al., 2019), math (Rincon-Flores et al., 2023), literature (Tan, 2018), social sciences (Buckley & Doyle, 2016), vocational education (Dahalan et al., 2023), dental education (Nguyen et al., 2023) , just to name a few. The research also tends to be cross-cultural in nature because many universities across globe has had a chance to study this topic, meaning that the beneficial uses of gamified learning approaches are not limited to only some sociocultural groups.

Another important implication of gamification to practice is that the use of e-learning and online learning tools tend to be cost-efficient and increase the availability of education as the spread of technology allows for this (Vrcelj et al., 2023). Especially in the context of Global South gamified education could have important practical value, for example, in increasing the level of girls' education. Applications like Kahoot! or MOOCs could be considered as they are cost-efficient, approachable and allow education for large groups of people at once. However, if practical implications of gamified education are taken to this level, it becomes even more important to acknowledge the system design, contextual, personal, and other smaller factors that influence the effectiveness of gamified learning.

On the other hand, one issue pointed out by some scholars is that the effects of gamification may be only short-term (Dehghanzadeh et al., 2023; Looyestyn et al., 2017). There is still insufficient evidence that gamification would produce positive learning outcomes that maintain a long-term effect or that it could be utilized for a longer time. In fact, some studies have found the opposite. Yang et al. (2023) found that the educational robots implemented in a laboratory course for a longer time negatively influenced students' interest and motivation to learn. It could be because gamified learning approach may have lost its novelty or for reasons such as those mentioned in the meta-analysis by Bai et al. (2020): gamification may be disliked because it may not bring any additional benefits to the learning process, especially in the long run. This could be something for the future research to address.

Nonetheless, all learning is not possible to just gamify or put online and wait for successful results. For example, Ross et al. (2023) implemented an online escape room during the covid-19 pandemic and although the virtual escape room was enjoyed by students, it was still less engaging for students, and they were more likely to struggle with

the challenges in comparison to the in-person escape room learning experience. This implies that physical contact, instructor-led methods, and non-online learning methods are still deemed in education.

To conclude, since most studies do report positive research outcomes, it is possible that the absence of a synthesised theory and the inconsistency in system design is the root cause why negative effects like fatigue, annoyance or boredom of students have been reported in the first place. Successful guidelines of gamified learning are still forming along with research. Nonetheless, some of the effects appear to be purely because of the technological nature of the gamified learning, meaning that not all are comfortable using these systems. Hence, promoting hybrid-learning methods carefully, as suggested by Bicen and Kocakoyun (2018), could be the way to get the most uses of gamified learning approaches and still maintain successful learning outcomes in education.

5.3   Limitations and ideas future research

One limitation of this thesis is that the number of studies included in this review is very small in comparison to the total amount of research on gamification. This combined with the fact that there may still be quite a bit of a hype around gamification in education has resulted in that more positive studies were included in this research, thus implying that the conclusions made from the current review may be a little distorted. Another limitation was that the choice of studies from ca. 5000 articles for the review was not strictly systematic in the end. Despite a distinct framework for selecting the studies and having subjective criteria to which base the selection decisions on, this aspect creates a situation where replicating this type of review is difficult. Additionally, it raises a question of possible selection bias that may have distorted the findings of the current review.

However, one of the strengths of this current review is that most of the research included was relatively recently published and included several broad reviews. Of the nearly 5,000 documents found from Scopus, half were published during the past three years, from 2020 to 2023, and these were also prioritized in the review. This is an important aspect in the sense that as gamification research evolves as quickly as new technological inventions are developing, many older pieces of research could be argued to have outdated findings. Technology in 2020s is very much different in comparison to the early 2010s. On the other hand, due to the large number of published studies it is likely that important pieces of recent research that could have offered valuable additional insights to the current review, e.g., the factors influencing the effectiveness of gamified learning, may have been missed.

As the development of technology is so fast in the modern-day context, it could even be argued that research on gamification is outdated already at the time of publication. New generations have different learning styles and a whole new school environment with its digitalized and efficiency-centred features, which is why it is difficult for system designers and researchers to keep up with the fast-paced change of educational trends. Therefore, as pointed out by Buckley and Doyle (2016, p. 1171): while gamification does offer a promising approach to learning, a lot of research should be conducted before "gamification could be considered a mature pedagogical technique". This means that research on, for example, more flexible system design of gamified methods could be valuable to respond to the needs of the learners of modern day.

Another notion that did not appear to be considered in the studies included in this current review is that in general modern technology appears to be very relevant in several everyday tasks and regular living. This raises a question, is there too much technology in the everyday life of students if gamified learning applications are more and more integrated into education? Could this cause cognitive and/or technological overload and technological stress among students, which eventually hinders the proven positive effects of gamification? As the research on the influence of technology on the development of children and adolescents is still taking baby steps, it could be argued that the long-term effect of gamified education is still unknown. Despite the hype over utilizing technology in education, the use of mobile devices in schools has recently been extensively criticised by the public. In fact, in Finland it is now in consideration that smartphones – that are often used for, example, in Kahoot or in accessing other gamified learning tools – would be banned in classrooms by the law (Paananen, 2023). Hence, longitudinal research on gamified learning approaches and their effects could be something for the future research to look into.

The latter point of the unknown long-term effects is especially important in the sense that technology is shown to produce effects, positive and negative, that may be significant when put into a larger scale. For example, the findings of López-Faican and Jaen (2023), where it was found that an AR game designed for children improved their empathic abilities and induced prosocial behaviour, imply that behaviour of younger generations could be relatively easily induced and modified with gamification methods, in good and in bad. Especially in the modern world where polarization of attitudes and opinions create tension as well as lowered empathic abilities, innovative learning approaches, like gamification, may have major implications in practice. This points out how the effects of implementing gamified learning approaches in education can be tremendous when put on scale.

6 Conclusion

Based on the research included in this review it can be established that gamification is a powerful pedagogical method or strategy to enhance learning, but only when implemented in a meaningful way. Since the empirical research is diverse and the findings contradicting in this topic, it allows to conclude that there are some limits to the effectiveness of gamification, but that overall, it is useful and effective in enhancing learning outcomes and motivation. Successful implementation depends on a range of factors like contextual factors, system design, personal characteristics, and possibly several other psychological and behavioural factors that are yet to be discovered and these should be considered all the way through to from designing the system to the end of the learning process.

Teachers must carefully consider its implementation based on the learning goals, the context, the characteristics of their student group and the relative benefits of adopting the gamified system in comparison to traditional methods. Gamification may be useful in prompting learning outcomes, but problematic if the learning outcomes get undermined due to poor system design, poor attitudes and ineffective implementation. The issues regarding gamification could be summarized by the ideas of Al-Msallam et al. (2023): while clear goals and real-time feedback may enhance individual growth and development of students, goals that are set too high considering the skills and needs of a learner may only be unattainable, source of anxiety and stress, and resource waste. On the other hand, it is possible that that tools like ChatGPT and Generative AI models are becoming more relevant learning tools for new generations as they can aid, for example, independent learning and offer study support for students (Mollick & Mollick, 2023). However, these tools offer a whole new point of view for using technology in education. In general, for future research on gamification in education the findings of this review imply that personalization of gamified applications and synthesis of its theory by investigating the factors influencing its effectiveness and implications of its uses are more current and value-adding approaches to gamification.

Overall, gamified learning seems to be a positive transformation to traditional pedagogical methods, but more research on the related factors should be conducted. In addition, as the modern day is filled with issues, such as cybersecurity threats and other information risks, careful consideration of the implementation process should be conducted.

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