Gamification Design to Increase Motivation in Online Learning Environments: A Systematic Review*

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ABSTRACT

Lack of learner motivation is one of the problems that can be encountered in online learning settings. Gamification can be offered as a possible solution to the motivational problems in online learning environments. In this regard, this study aims to give a general idea of gamification studies focusing on motivation in online learning and to provide practical suggestions on designing gamification. In order to access relevant studies, Web of Science Core Collection database was reviewed. In total, 90 articles in SSCI index journals have been systematically analyzed and 10 of them meeting the inclusion criteria were reviewed in detail. While one of those studies revealed no significant effect of gamification on motivation, the rest of them showed that gamification is effective in fostering students' motivation. This review provides a general overview about the effect of gamification on motivation and suggestions for future implications such as including badges or points to show competence, using competitive and collaborative elements together, preparing different types of leaderboards, providing students with immediate and automated feedback, giving students challenges suitable for their skills, developing adaptive gamification systems for different learner needs, and eliminating technical problems.

INTRODUCTION

The last two years showed us that online education could be an alternative to face-to-face instruction during extreme conditions such as pandemic. However, it is not the only case where online education could be used. Learners and institutions have shown a growing interest towards online learning for many years. One of the reasons why online learning gained so much popularity is that it helps to overcome "physical and geographical barriers" (Zhu et al. 2020, p.1486). It can be an opportunity for people who cannot access traditional education because of money, time, location or personal issues (Hartnett, 2016). Despite these advantages, online education has raised some concerns, one of which is student motivation. Having lack of motivation is one of the challenges that students face in online learning environments (Aboagye et al., 2020; Adnan & Anwar, 2020; Atmojo & Nugroho, 2020; Bekele, 2010; Fong, 2022; Kim & Frick, 2011; Lovrić et al., 2020; Rohan et al., 2021). According to Bekele (2010) a decent amount of motivation leads to success. The more motivation results in more engagement and students are likely to reach learning goals (Kim & Frick, 2011). Motivated students tend to be engaged in activities, organize their learning, observe their progress, use necessary materials to reach their goals, have positive thoughts about their possible success, and these actions lead to learning; so it can be said that motivation is related with learning and achievement (Pintrich & Schunk, 2002).

Keller's ARCS model is one of the most prominent motivation theories explaining the relationship between motivation and learning (Pintrich & Schunk, 2002). ARCS stands for attention, relevance, confidence and satisfaction (Keller, 2008). In order for students to be motivated, their sense of curiosity should be awakened; the instruction should be parallel with their personal goals or values; students should be certain of their abilities to be successful; and the outcomes should be similar with the students' expectations (Keller, 2008). According to Self Determination Theory, people can be intrinsically motivated when the three psychological needs - competence, autonomy and relatedness - are met (Ryan & Deci, 2000). In this context, gamification, which was defined as using game components in non-game contexts (Deterding et al., 2011), could be suggested as a way of instruction because of the fact that it enhances student motivation (Álvaro-Tordesillas et al., 2020; Bicen & Kocakoyun, 2018; Quiao et al., 2022; Rincon-Flores et al., 2022; Rohan et al., 2021; Şahin et al., 2017). Game elements have the potential to motivate students by addressing the above-mentioned psychological needs (Quiao et al., 2022; Sailer et al., 2017).

In recent years there has been an increasing interest in using gamification for educational purposes and a considerable number of studies have been conducted researching the effects of gamification on students' motivation for learning. Despite few of them (Hanus & Fox, 2015; Kyewski & Krämer, 2018) having contradictory results, many studies put forward significant positive effects of gamification and game elements (Ding et al., 2017; Hakulinen et al., 2013; Sitra et al., 2017) on learners' motivation. In online environments, while some researchers gamified learning environments via some applications they developed (Ding et al., 2017; Sun

& Hsieh, 2018), some others gamified their learning environments by using systems or applications that already exist such as *Moodle* (Bovermann et al., 2018; Quiao et al., 2022), *Kahoot!* (Medina & Hurtado, 2017) and *ClassDojo* (Hursen & Bas, 2019). What most of these studies have in common is that the gamified learning environment they established is encouraging and increases students' motivation. In a recent review study of the possible effects of gamification on learning, motivation was one of the main themes that emerged, and researchers calling gamification as the "key enabler of motivation" (Zainuddin et al., 2020, p.1) concluded that game elements increased students' motivation. Similarly, Antonaci et al. (2019) made a review on how game elements and gamification in online learning affects students' learning behavior and found that badges, rewards and point system affected students' motivation positively. According to Sailer et al. (2017), well-designed gamification would address the motivational issues in online learning settings. This study focuses on motivational issues and how gamified environments serve motivational problems, and aims to conduct a systematic review on how to design gamification in online learning environments to promote motivation, and to establish design principles in this regard.

METHOD

Research Design and Search Strategy

A systematic literature review was conducted to present an overview how gamification was used for motivational purposes in online learning environments. We used Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement (Moher et al., 2009) as a guide. PRISMA includes four steps: identification, screening, eligibility and included.

As it can be seen in Figure 1, starting with the identification step, in order to access relevant studies, the Web of Science Core Collection database was chosen, and publications were obtained using the following keyword sets in the "Topic" area. To cover all possible gamification studies using other terms such as "gamify" or "gamified", each keyword set contains "gamif*, motivation" terms, and one of the following terms "online learning", "online course", "distance education", "virtual learning", "e-learning", "distance learning", "MOOC". Refinement options applied to the initial results were the type of document (Article, Early Access and Review), category ("Education Educational Research" and "Education Scientific Disciplines"), index ("SSCI") and timespan ("All Years"). The last search was conducted in August 2021. The initial query revealed 90 results. In the screening step, all of them were screened by both of the authors separately by title and abstracts applying the inclusion and exclusion criteria (Figure 1) and 58 of them were excluded. In order to decide if the rest of the studies (f=32) eligible for review, full texts were assessed collaboratively and studies not meeting the criteria were excluded in the eligibility step.
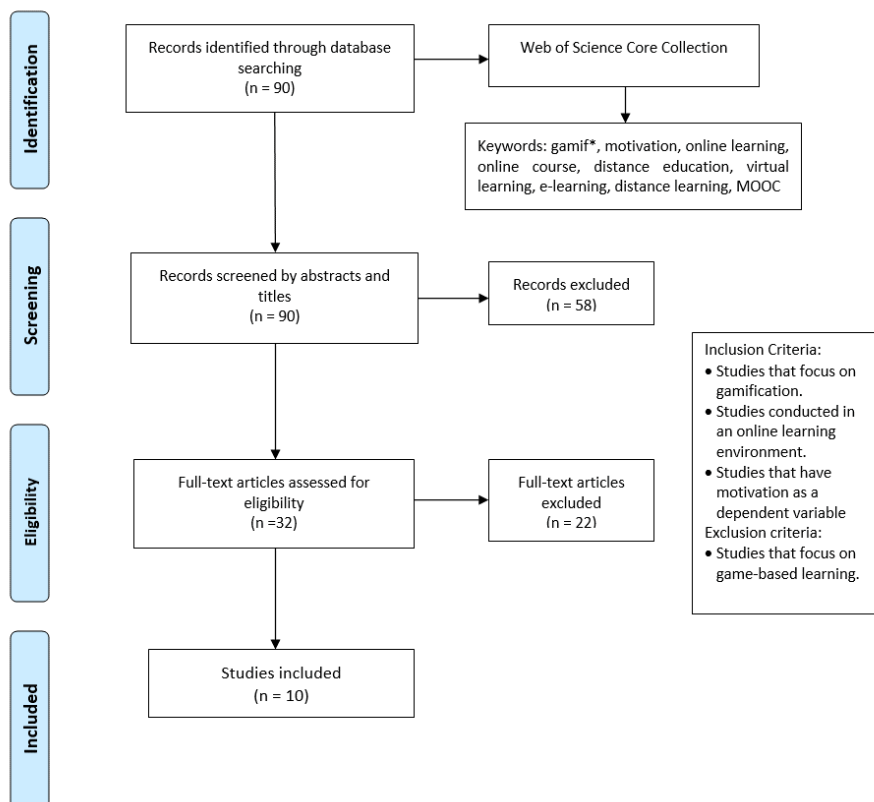

Figure 1. Systematic review steps according to PRISMA (Moher et al., 2009).

Finally, 10 of the studies were included for the detailed analysis in the last step (Table 1).

Table 1. Summary of the articles in final review

Articles	Online learning platform	Game element(s)/ mechanics
Domínguez, A., Saenz-de-Navarrete, J., de-Marcos, L., Fernández-Sanz, L., Pagés, C., Martínez-Herráiz, J.J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers and Education, 63*, 380-392. https://doi.org/10.1016/j.compedu.2012.12.020	Blackboard	Achievements (as reward), Leaderboard
Borrás-Gené, O., Martínez-Nuñez, M., & Fidalgo-Blanco, Á. (2016). New Challenges for the motivation and learning in engineering education using gamification in MOOC. *International Journal of Engineering Education, 32*(1B), 501–512.	MiriadaX (MOOC platform)	Badges, Contest
Bovermann, K., Weidlich, J., & Bastiaens, T. (2018). Online learning readiness and attitudes towards gaming in gamified online learning – a mixed methods case study. *International Journal of Educational Technology in Higher Education,15*(1). https://doi.org/10.1186/s41239-018-0107-0	Moodle	Badges, Progress bar
Kyewski, E., & Krämer, N. C. (2018). To gamify or not to gamify? An experimental field study of the influence of badges on motivation, activity, and performance in an online learning course. *Computers & Education, 118*, 25-37. https://doi.org/10.1016/j.compedu.2017.11.006	Moodle	Badges
Pilkington, C. (2018). A playful approach to fostering motivation in a distance education computer programming course: behaviour change and student perceptions. *The International Review of Research in Open and Distributed Learning*, *19*(3). https://doi.org/10.19173/irrodl.v19i3.3664	University's Learning Management System	Story, Nickname, Leaderboard, Tasks, Points, Badges, Level, Feedback Loop
van Roy, R., & Zaman, B. (2018). Need-supporting gamification in education: An assessment of motivational effects over time. *Computers & Education, 127*, 283-297. https://doi.org/10.1016/j.compedu.2018.08.018	Google+ Communities	Challenge, Badge, Point, Leaderboard, Team
Çağlar-Özhan, Ş., & Arkün-Kocadere, S. (2020). The effects of flow, emotional engagement, and motivation on success in a gamified online learning environment. *Journal of Educational Computing Research*. 1-26. https://doi.org/10.1177/0735633118823159	Wordpress LMS	Team, Gifting, Collection, Achievement, Point, Content Unlocking, Boss Fight, Level, Surprise
Li, X. & Chu, S.K.W. (2021). Exploring the effects of gamification pedagogy on children's reading: A mixed-method study on academic performance, reading-related mentality and behaviors, and sustainability. *British Journal of Educational Technology, 52*, 160-178. https://doi.org/10.1111/bjet.13057	Reading Battle (A gamified platform developed by HKU Faculty of Education)	Battles, Points, Virtual Badges, Leaderboards
Bai, S., Hew, K. F., Sailer, M., & Jia, C. (2021). From top to bottom: How positions on different types of leaderboard may affect fully online student learning performance, intrinsic motivation, and course engagement. *Computers & Education, 173*, Article 104297. https://doi.org/10.1016/j.compedu.2021.104297	Moodle	Points, Leaderboards
Hassan, M. A., Habiba, U., Majeed, F., & Shoaib, M. (2021) Adaptive gamification in e-learning based on students' learning styles. *Interactive Learning Environments (29)*4, 545-565. https://doi.org/10.1080/10494820.2019.1588745	A proposed LMS platform by researchers	Badges, Levels, Challenges, Progress bars, Achievements of points.

RESULTS

Theoretical Foundations of the Studies on Gamification and Motivation

It can be seen that six of the articles scrutinized in this review based their gamification studies on a motivation theory named as Self Determination Theory (SDT). According to SDT, people have three basic psychological needs: competence, autonomy and relatedness (Ryan & Deci, 2000). Competence can be defined as the perceived adequateness in a subject; autonomy as acting voluntarily with a sense of choice; and relatedness as a state of feeling connected to a person, a group or a culture (Deci & Ryan, 2008). It can be said that fulfilling these needs results in facilitating intrinsic motivation.

While researchers (Borrás-Gené et al., 2016; Bovermann et al., 2018; Hassan et al., 2021; Kyewski & Krämer, 2018; Li & Chu, 2021; Pilkington, 2018; Quiao et al., 2022; van Roy & Zaman, 2018) used SDT as a theoretical background in their studies, Çağlar-Özhan and Arkün-Kocadere (2020) based their study on the ARCS model of motivation and the Flow Theory. The letters in ARCS stand for attention, relevance, confidence and satisfaction, which are the main conditions for motivation (Keller, 2008). Flow can be described as a mental state when a person cannot track the time and the outer world as a result of immersing in an activity (Csikszentmihalyi, 1997). On the other hand, Domínguez and his friends (Domínguez et al., 2013) indicate that gamification should focus on cognitive, emotional, and social areas and they designed their study in accordance with these areas.

How Gamification Motivates

As mentioned in the previous section, researchers adopted some theoretical perspectives, according to which they designed their learning environments. SDT based studies showed that gamified environments can serve competence, autonomy and relatedness in different ways. In order to ensure autonomy, taking part in activities could be voluntary for students (Pilkington, 2018; van Roy & Zaman, 2018), in other words giving them the control of choosing which activity to take part in (Li & Chu, 2021; Quiao et al., 2022) as well as determining a name to represent themselves (Pilkington, 2018) or choosing a profile picture (Quiao et al., 2022). To create a sense of feeling competence in students, they can be provided with challenges that get harder gradually (van Roy & Zaman, 2018) and badges or points can be used after achieving something they were assigned (Borrás-Gené et al., 2016; Pilkington, 2018; Quiao et al., 2022). Herein, van Roy and Zaman (2018) pointed out that if people know which action will be rewarded, it can cause autonomy to reduce, so in order to prevent it and support students' competence as well, they used badges that were not announced before. Using discussion forums for students presenting themselves and reaching out to them by e-mails to inform them about badges, points or their ranks can help students feel related (Pilkington, 2018). Another way of fostering the feeling of relatedness is putting students in teams so that they can compete to get a higher rank in the leaderboard while interacting with other teams (Li & Chu, 2021; van Roy & Zaman, 2018). Bovermann et al. (2018), who built their study on SDT, used badges and progress bars to foster intrinsic motivation and to show students their progress and mastery. Their study revealed that students showed great motivation and were content with the gamified learning setting. In a study on MOOC (Borrás-Gené et al., 2016), researchers gamified their platform by adding badges and contests. The study revealed that gamification supports interaction and learning as well as enhancing motivation. It is also found that badges and certificates encourage students to complete their courses so drop-out rates decreased. Apart from the mentioned studies above, Kyewski and Krämer's (2018) study, which also based their study on SDT, did not find a significant effect of gamification on intrinsic motivation. The study examined the effects of digital badges on students' intrinsic motivation, and it turned out there was no positive or negative effect of gamification on students' motivation even though they had different levels of motivation at the beginning. The descriptive findings revealed that students did not like the badges and did not feel motivated, but researchers believed that there may be some possible reasons for this situation. Firstly, the system was not easy to use even for the students in the non-gamified group so the information about badges may have been an extra burden for students in the gamified group. Secondly, the study took long, and the number of participants decreased in time. Thirdly, with the aim to create social comparison between students, one of the control groups could see the badges of other students but they were not obvious on the system, and students had to seek them. Researchers said that being able to see each other's badges may have caused students to feel externally controlled and this kind of competition could be demotivating for students.

Taking ARCS and flow principles as a ground, Çağlar-Özhan and Arkün-Kocadere (2020) gamified their online course using various game elements, providing challenges which get difficult in time, creating a story related to students interests, designing levels suitable for students' skills, and giving them immediate feedback. Researchers stated that a person's fully focusing on a task in a flow state is related to attention; feeling enjoyed is related to satisfaction; and having tasks in line with their skills is related to confidence. They found that the sense of flow and emotional engagement created by gamification affected students' motivation positively, in other words the sense of flow and engagement were great predictors of students' motivation.

Domínguez et al. (2013) designed their study in accordance with cognitive, emotional, and social areas. For cognitive area, they set rules and tasks to help students gain expertise in the process and added a task evaluation mechanism; for emotional area, they used achievements and collectables as rewards to make students feel doing well; for social area, they preferred competitive interaction rather than cooperative or social interaction and students were ranked by the number of achievements they earned while having a chance to compare themselves with their classmates as well. The study concluded that gamified e-learning platforms had emotional and social effects on students and could improve student motivation.

Bai et al. (2021) approached the topic within the perspective of social comparison and analyzed the effects of absolute leaderboard and relative leaderboard on students' intrinsic motivation. While in an absolute leaderboard students can see all of the students' names, exact positions, profile photos and points; in a relative leaderboard they see the relative positions of their five neighbor students, their profile photos, names and points. In the absolute leaderboard situation, high-ranked students showed significantly higher levels of motivation than the lower-ranked students. Seeing others in the leaderboard aroused the sense of competition in students and low-ranked students also tried to do better. However, researchers stated that seeing others can cause low-ranked students to lose interest and impede their motivation in time. Given that, unlike high and mid-ranked students, low-ranked students do not prefer public comparison because they find it embarrassing. On the other hand, in the relative leaderboard situation, researchers did not find significant difference in terms of intrinsic motivation. It is concluded that because students do not have peer pressure, they are likely to be pleased with their position. Namely, students' not knowing exact positions and competing with peers at similar levels diminished the feeling of comparison and competition. Researchers claimed that in comparison with the absolute leaderboard situation, in relative leaderboard, students tend to be more cooperative and less competitive. Furthermore, in

relative leaderboard settings, most of the low-ranked students find public comparison better because they can compare themselves with the ones who are close to them in terms of skills and abilities. In order to alleviate sadness of students who are not content with the leaderboard, top-five students can be shown on the absolute leaderboard, leaderboards can be renewed every two weeks, or absolute leaderboards and relative leaderboards can be used interchangeably each term (Bai et al., 2021).

Studies showed that feedback mechanism in gamification is one of the features that improves motivation, as well. Gamified learning environments give students the opportunity to monitor their learning by using specific game elements. Bovermann et al. (2018) reported that badges and progress bars motivated students in terms of obtaining direct feedback from the teacher and their survey revealed a high percentage of motivated students by gamified learning. In a similar vein, Pilkington (2018) stated that points, badges and levels not only foster competence in students but also, they work as supportive feedback showing students how well they are doing during the process. In another study (Domínguez et al., 2013), achievements were used as a form of reward but at the same time it was aimed to generate positive emotions in students by rewarding them immediately to show their performance on a task. They also added a mechanism for task evaluation, but it did not work well. For their tasks to be evaluated students had to upload the screenshots of their work, which was time consuming for them because of the technical issues. Students also realized that they could earn points even if they submit a blank paper. As the researchers emphasized the need for the immediacy of feedback (Çağlar-Özhan & Arkün-Kocadere, 2020; Domínguez et al., 2013; Pilkington, 2018) pointing out that possible problems could emerge while evaluating large tasks (Pilkington, 2018), and delayed feedback could be demotivating, it can be concluded that the evaluation and feedback system should be designed carefully to provide students with immediate feedback and prevent them from manipulating the system.

Another point that emerged from the studies is the importance of individual differences. Researchers stated that designing learning settings according to students' different needs and skills is crucial because game elements can affect each student in a different way (Hassan et al., 2021; van Roy & Zaman, 2018). In other words, they should be designed in a way that can suit the aspects of the target group and grab their attention (Çağlar-Özhan & Arkün-Kocadere, 2020). According to Hassan et al. (2021) each student should not be provided with the same gamified experience, so they designed an adaptive system for their MOOC platform to support both intrinsic and extrinsic motivation in line with different learner styles. They also stated that some of the existing designs fail because of focusing only on the extrinsic motivation and adaptive systems can answer the three needs of intrinsic motivation (relatedness, competence, autonomy). The study found that in the adaptive system, students' motivation increased significantly. Considering individual differences, researchers pointed out using competition mechanisms carefully to avoid the diminishing effect of competition on motivation because some students do not like the idea of publicly competing with friends and find it demotivating (Bai et al. 2021; Domínguez et al., 2013; Kyewski & Krämer, 2018). In this regard using it with collaboration could help lessen the negative effects of competition on students who like collaborative works (Çağlar-Özhan & Arkün-Kocadere, 2020) or designing game elements which let students to see or not to see each other's achievements or badges (Kyewski & Krämer, 2018).

CONCLUSION AND DISCUSSION

This systematic review provides an overview of the motivational effects of gamification in online learning environments. 90 studies in SSCI index journals have been screened systematically for the study. For the final review, there were 10 articles meeting the criteria. There was no time span for the reviewed articles; the earliest one was published in 2013 and the rest of them published between 2016-2021, so the study reflects a current view in this regard.

Reviewed articles looked into the relationship between gamification and motivation from the perspective of Self Determination Theory, ARCS model of motivation, Flow Theory, cognitive, emotional, social areas and social comparison. Except one, which did not find any negative or positive effects (Kyewski & Krämer, 2018), the rest of the studies revealed that gamification could be effective in facilitating motivation in online learning environments by supporting the feeling of relatedness, competence and autonomy - the fundamentals of SDT (Bai et al. 2021; Boverman et al., 2018; Li & Chu, 2021; Pilkington, 2018; van Roy & Zaman, 2018) - and the sense of flow and engagement (Çağlar-Özhan & Arkün-Kocadere, 2020). Game elements are motivating for students in terms of getting feedback from the instructor (Boverman et al., 2018) observing their own progress (Li & Chu, 2021; Boverman et al., 2018), being rewarded for their actions (Domínguez et al., 2013), and creating a competitive environment (Bai et al., 2021; Pilkington, 2018). These findings are in line with the previous studies, too. In a study by Chapman and Rich (2018), the most motivating elements for students were the ones related to giving feedback, monitoring their own progress, and comparing themselves with others.

This review has yielded promising impacts of gamification on motivation in online learning environments. Besides putting forward motivational effects of gamification, we also aimed to analyze these studies to present principles for a good gamification design. So, in accordance with the purpose of supporting motivation, the following lines will provide practical suggestions for designs.

Firstly, competition mechanism is a matter of concern mentioned in studies because some students do not like the idea of publicly competing (Bai et al., 2021; Domínguez et al., 2013; Kyewski & Krämer, 2018; Li & Chu, 2021). In a study (Kocadere & Çağlar, 2018), which focused on player types, it was revealed that while *killers* and *achievers* like competition, *socializers* and *explorers* do not. So, using social and cooperative mechanisms together with competition (Çağlar-Özhan & Arkün-Kocadere, 2020; Domínguez et al., 2013) can be suggested as a way to shift focus from competition. Using the team element and having students do the tasks in collaboration can be used for that purpose as well (Çağlar-Özhan & Arkün-Kocadere, 2020). Team competition can be used to increase social interaction and to serve the relatedness dimension of SDT at the same time (Li & Chu, 2021; van Roy &

Zaman, 2018). These seem to be consistent with other research which found the team element supported community building (Aldemir et al., 2018) and fostered social relatedness by giving students a common goal (Sailer et al., 2017).

Progress bars can be used to show students what and how they are doing during the process (Boverman et al., 2018; Hassan et al. 2021). Progress bars are a good way of allowing students to track their progress in a non-competitive environment without comparing themselves with others (Sailer et al., 2017), to visualize their status, to support self-control and to present an overview in online settings (Olsson et al., 2015). Instead of progress bars, students' data can be visualized in a more comprehensive way by using dashboards. In their review study, Pérez-Álvarez et al. (2018) revealed that visualization can improve students' motivation and it is important to retain that motivation in online environments. In addition, dashboards, being highly visual and representing students' performance in an enrolled course (Roberts et al., 2017; Teasley, 2017) can be configured to process real-time data (Bodily et al., 2018), in this way it serves as automated, immediate and personalized (Teasley, 2017) feedback. To give immediate feedback, task evaluation systems should be as automated as possible (Domínguez et al., 2013; Pilkington, 2018) and should be designed carefully to avoid students from gaming the system (Domínguez et al., 2013; van Roy & Zaman, 2018). Story or journey elements can also be used to set a goal to be reached or check students' progress (Pilkington, 2018). Creating a story similar to a real-world setting (Nicholson, 2015) and appealing to students' interest (Çağlar-Özhan & Arkün-Kocadere, 2020) motivates students. Supporting the story with related visuals can also be motivating. Çağlar-Özhan and Arkün-Kocadere (2020) visualized the level, achievement and collection elements relevant to their story to keep students engaged in the gamified system.

Badges are among the commonly used elements in gamification. However, badges should be noticeable, otherwise students may not be able to see the advantages of gamification (Boverman et al., 2018). Without overloading students with guidelines and information about badges and making a simple design in which students do not have to search for the badges they or the others earned (Kyewski & Krämer, 2018) could be the solution.

Students should be given challenges that should increase in difficulty gradually (Çağlar-Özhan & Arkün-Kocadere; van Roy & Zaman, 2018) to support competence (van Roy & Zaman, 2018), confidence (Çağlar-Özhan & Arkün-Kocadere, 2020) and not to create disappointment and discouragement in students (Pilkington, 2018). Creating a balance between students' ability and the difficulty of the challenges results in a flow state. Because students gain mastery in time, designing levels that requires reaching a certain point (Çağlar-Özhan & Arkün-Kocadere, 2020; Pilkington, 2018) and increasing these points as students progress in levels, serves flow theory and it also supports students' competence.

Lastly, technical problems should not hinder a good design from working well. So, learning management systems should be easy to use and should be gamified carefully in order not to be time consuming and create an extra burden (Domínguez et al., 2013, Pilkington, 2018) for students. Introducing the system to students with an interactive, step-by-step guide could help to overcome technical difficulties (Domínguez et al., 2013).

As discussed, gamification could be a solution for lack of motivation in online learning environments. With this study, we aimed to reveal how gamification could be a solution for motivational problems and to present a guide for gamification designers. In this context, we brought some suggestions for practitioners not only exclusive to online learning but some of them could be used in face-to-face learning settings as well:

- Students should be given challenges/tasks getting difficult progressively to make them face new learning situations.
- Students should be provided with immediate and automated feedback. Game elements like badges and points could be the basis of this feedback and could be used to show students' mastery/competence. While the feedback could be given separately in the student interface, dashboards which bring the feedback together, could also be used as an option to allow students to monitor their own progress.
- Chosen learning management systems should have high usability in order to reveal the potential of a good gamification design.
- Individual differences such as player types should be taken into consideration while designing game elements and mechanics. Adaptive gamification could also be a way to meet different learner needs, learner styles or learning behaviors.
- Design components chosen based on the dimensions of motivational theories such as SDT could strengthen the structure.
- Competition and collaboration mechanisms could be used together to balance the demotivating effects of competition. "Team" could be one of the elements that could support collaboration and social relatedness. Leaderboards, which also serve social comparison and competition, can be adapted in this aim, as well. One way of doing this is using relative leaderboards instead of absolute leaderboards; secondly, top-5 or top-10 students could be ranked in absolute leaderboards; or leaderboards could be reset occasionally so that students at the bottom in the previous leaderboard can get a chance to rank higher in the new one.

While this review provided promising results, it is limited in some ways. Firstly, we used only the Web of Science Core Collection as a database and included the SSCI index articles, so we had a very limited number of studies. As we excluded documents other than articles for the review process, we recommend future researchers to include other types of documents such as book chapters, conference proceedings or review articles, and to reach studies from different databases. Moreover, our review reached general principles rather than putting forth a detailed design proposal for online learning due to the nature of the studies analyzed. Within this context, using various data sources and document types can help broaden the study and analyze specific game elements in-depth. To deepen the study, the relationship between gamification and motivation may be handled from a different and broader

perspective, the possible effects of motivation on performance may be analyzed and the suggestions can be validated by conducting experimental studies.

Ethics and Consent: Ethics committee approval is not required as it does not involve clinical research on humans and does not contain retrospective studies in accordance with the Law on Protection of Personal Data.

REFERENCES

Aboagye, E., Yawson, J. A., & Appiah, K. N. (2020). COVID-19 and E-Learning: The Challenges of Students in Tertiary Institutions. *Social Education Research, 2*(1), 1-7. https://doi.org/10.37256/ser.212021422

Adnan, M., & Anwar, K. (2020). Online learning amid the COVID-19 pandemic: Students' perspectives. *Journal of Pedagogical Sociology and Psychology, 2*(1), 45-51. https://doi.org/10.33902/JPSP.2020261309

Aldemir, T., Celik, B., & Kaplan, G. (2018). A qualitative investigation of student perceptions of game elements in a gamified course. *Computers in Human Behavior, 78*, 235-254. https://doi.org/10.1016/j.chb.2017.10.001

Álvaro-Tordesillas, A.; Alonso-Rodríguez, M.; Poza-Casado, I., & Galván-Desvaux, N. (2020). Gamification experience in the subject of Descriptive Geometry for Architecture. *Educación XX1, 23*(1), 373-408, https://doi.org/10.5944/educXX1.23591

Antonaci, A., Klemke, R., & Specht, M. (2019) The effects of gamification in online learning environments: a systematic literature review. *Informatics*, *6*(3), Article 32. https://doi.org/10.3390/informatics6030032

Atmojo, A. E. P., & Nugroho, A. (2020). EFL Classes Must Go Online! Teaching Activities and Challenges during COVID-19 Pandemic in Indonesia. *Register Journal, 13*(1), 49-76. https://doi.org/10.18326/rgt.v13i1.49-76

Bai, S., Hew, K. F., Sailer, M., & Jia, C. (2021). From top to bottom: How positions on different types of leaderboard may affect fully online student learning performance, intrinsic motivation, and course engagement. *Computers & Education, 173*, Article 104297. https://doi.org/10.1016/j.compedu.2021.104297

Bekele, T. A. (2010). Motivation and Satisfaction in Internet-Supported Learning Environments: A Review. *Educational Technology & Society, 13*(2), 116–127.

Bicen, H., & Kocakoyun, Ş. (2018). Perceptions of students for gamification approach: Kahoot as a case study. *International Journal of Emerging Technologies in Learning, 13*(2), 72-93. https://doi.org/10.3991/ijet.v13i02.7467

Bodily, R., Ikahihifo, T. K., Mackley, B., & Graham, C. R. (2018). "The design, development, and implementation of student-facing learning analytics dashboards." *Journal of Computing in Higher Education, 30*(3), 572–598. https://doi.org/10.1007/s12528-018-9186-0

Borrás-Gené, O., Martínez-Nuñez, M., & Fidalgo-Blanco, Á. (2016). New Challenges for the motivation and learning in engineering education using gamification in MOOC. *International Journal of Engineering Education, 32*(1B), 501–512.

Bovermann, K., Weidlich, J., & Bastiaens, T. (2018). Online learning readiness and attitudes towards gaming in gamified online learning – a mixed methods case study. *International Journal of Educational Technology in Higher Education, 15*(1), Article 27. https://doi.org/10.1186/s41239-018-0107-0

Chapman, J. R., & Rich, P. J. (2018) Does educational gamification improve students' motivation? If so, which game elements work best?. *Journal of Education for Business, 93*(7), 315-322. https://doi.org/10.1080/08832323.2018.1490687

Csikszentmihalyi, M. (1997). Finding flow: The psychology of engagement with everyday life. Basic Books.

Çağlar-Özhan, Ş., & Arkün-Kocadere, S. (2020). The effects of flow, emotional engagement, and motivation on success in a gamified online learning environment. *Journal of Educational Computing Research*, *57*(8), 2006-2031. https://doi.org/10.1177/0735633118823159

Deci, E., & Ryan, R. (2008). Facilitating Optimal Motivation and Psychological Well- Being Across Life's Domains. *Canadian Psychology, 49*, 14-23. https://doi.org/10.1037/0708-5591.49.1.14

Deterding, S., Dixon, D., Khaled, R. & Nacke, L. (2011). From game design elements to gamefulness: defining gamification. 15th International Academic MindTrek Conference, 9-15. https://doi.org/10.1145/2181037.2181040

Ding, L., Kim, C., & Orey, M. (2017). Studies of student engagement in gamified online discussions. *Computers & Education, 115*, 126-142. https://doi.org/10.1016/j.compedu.2017.06.016

Domínguez, A., Saenz-de-Navarrete, J., de-Marcos, L., Fernández-Sanz, L., Pagés, C., Martínez-Herráiz, J.J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers & Education, 63*, 380-392. https://doi.org/10.1016/j.compedu.2012.12.020

Fong, C. J. (2022). Academic motivation in a pandemic context: A conceptual review of prominent theories and an integrated model. *Educational Psychology*. https://doi.org/10.1080/01443410.2022.2026891

Hakulinen, L., Auvinen, T., & Korhonen, A. (2013). Empirical study on the effect of achievement badges in TRAKLA2 online learning environment. *Proceedings of Learning and Teaching in Computing and Engineering (LaTiCE) Conference, Macau*, 47-54. https://doi.org/10.1109/LaTiCE.2013.34

Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & Education, 80*, 152-161. https://doi.org/10.1016/j.compedu.2014.08.019

Hartnett M. (2016). The importance of motivation in online learning. In *Motivation in Online Education*. Springer.. https://doi.org/10.1007/978-981-10-0700-2_2

Hassan, M. A., Habiba, U., Majeed, F., & Shoaib, M. (2021) Adaptive gamification in e-learning based on students' learning styles. *Interactive Learning Environments 29*(4), 545-565. https://doi.org/10.1080/10494820.2019.1588745

Hursen, C., & Bas, C. (2019). Use of gamification applications in science education. *International Journal of Emerging*

Technologies in Learning, 14(1), 4-23. https://doi.org/10.3991/ijet.v14i01.8894

Keller, J. M. (2008). First principles of motivation to learn and e3-learning. *Distance Education, 29*(2), 175-185, https://doi.org/10.1080/01587910802154970

Kim, K.-J., & Frick, T. W. (2011). Changes in student motivation during online learning. *Journal of Educational Computing Research, 44*(1), 1–23. https://doi.org/10.2190/EC.44.1.a

Kocadere, S. A & Çağlar, Ş. (2018). Gamification from player type perspective: A case study. *Educational Technology & Society, 21*(3), 12-22. http://www.jstor.org/stable/26458503

Kyewski, E., & Krämer, N. C. (2018). To gamify or not to gamify? An experimental field study of the influence of badges on motivation, activity, and performance in an online learning course. *Computers & Education, 118*, 25-37. https://doi.org/10.1016/j.compedu.2017.11.006

Li, X. & Chu, S.K.W. (2021), Exploring the effects of gamification pedagogy on children's reading: A mixed-method study on academic performance, reading-related mentality and behaviors, and sustainability. *British Journal of Educational Technology, 52*, 160-178. https://doi.org/10.1111/bjet.13057

Lovrić, R., Farčić, N., Mikšić, Š., & Včev, A. (2020). Studying During the COVID-19 Pandemic: A Qualitative Inductive Content Analysis of Nursing Students' Perceptions and Experiences. *Education Sciences, 10*(7), Article 188. http://dx.doi.org/10.3390/educsci10070188

Medina, E. G. L., & Hurtado, C. P. R. (2017). Kahoot! A digital tool for learning vocabulary in a language classroom. *Revista Publicando, 4*(12), 441-449. https://revistapublicando.org/revista/index.php/crv/article/view/673/pdf_478

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group (2009) Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med 6*(7): e1000097. https://doi.org/10.1371/journal.pmed.1000097

Nicholson S. (2015) A RECIPE for meaningful gamification. In T. Reiners, & L.C. Wood (Ed.), *Gamification in Education and Business* (pp. 1-20). Springer. https://doi.org/10.1007/978-3-319-10208-5_1

Olsson, M., Mozelius, P., & Collin, J. (2015). Visualisation and gamification of e-learning and programming education. *The Electronic Journal of e-Learning, 13*(6), 441-454. https://academic-publishing.org/index.php/ejel/article/view/1947

Pérez-Álvarez R., Maldonado-Mahauad J., Pérez-Sanagustín M. (2018) Tools to Support Self-Regulated Learning in Online Environments: Literature Review. In: Pammer-Schindler V., Pérez-Sanagustín M., Drachsler H., Elferink R., Scheffel M. (Ed.) Lifelong Technology-Enhanced Learning. EC-TEL 2018. Lecture Notes in Computer Science, vol 11082. Springer, Cham. https://doi.org/10.1007/978-3-319-98572-5_2

Pilkington, C. (2018). A playful approach to fostering motivation in a distance education computer programming course: behaviour change and student perceptions. *The International Review of Research in Open and Distributed Learning, 19*(3), 282-298. https://doi.org/10.19173/irrodl.v19i3.3664

Pintrich, P. R., & Schunk, D. H. (2002). *Motivation in Education*. Englewood Cliffs, NJ.

Qiao, S., Yeung, S. S.-S., Shen, X., & Chu, S. K. W. (2022). The effects of a gamified morphological awareness intervention on students' cognitive, motivational and affective outcomes. *British Journal of Educational Technology*, 00, 1– 25. https://doi.org/10.1111/bjet.13178

Rincon-Flores, E. G., Mena, J., & López-Camacho, E. (2022). Gamification as a teaching method to improve performance and motivation in tertiary education during COVID-19: A research study from mexico. *Education Sciences*, *12*(1), 49. https://doi.org/10.3390/educsci12010049

Roberts, L. D., Howell, J. A., & Seaman, K. (2017). Give me a customizable dashboard: Personalized learning analytics dashboards in higher education. *Technology, Knowledge and Learning, 22*, 317-333. https://doi.org/10.1007/s10758-017-9316-1

Rohan, R., Pal, D., Funilkul, S., Chutimaskul, W., & Eamsinvattana, W. (2021). How gamification leads to continued usage of moocs? A theoretical perspective. *IEEE Access*, *9*, 108144-108161. https://doi.org/10.1109/ACCESS.2021.3102293

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*, 54-67. https://doi.org/10.1006/ceps.1999.1020

Sailer, M., Hense, J. U., Mayr, S. K., & Mandl, H. (2017). How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. *Computers in Human Behavior, 69*, 371–380. https://doi.org/10.1016/j.chb.2016.12.033

Sitra, O., Katsigiannakis, V., Karagiannidis, C., & Mavropoulou, S. (2017). The effect of badges on the engagement of students with special educational needs: A case study. *Education and Information Technologies, 22*(6), 3037-3046. https://doi.org/10.1007/s10639-016-9550-5

Sun, J., & Hsieh, P. (2018). Application of a gamified interactive response system to enhance the intrinsic and extrinsic motivation, student engagement, and attention of English learners. *Educational Technology & Society, 21*(3), 104-116. https://www.jstor.org/stable/26458511

Şahin, Y. L., Karadağ, N., Bozkurt, A., Doğan, E., Kılınç, H., Uğur, S., Gümüş, S., Öztürk, A., & Güler, C. (2017). The use of gamification in distance education: A web-based gamified quiz application. *Turkish Online Journal of Qualitative Inquiry, 8*(4), 372-395. https://doi.org/10.17569/tojqi.329742

Teasley, S. D. (2017). Student facing dashboards: One size fits all?. *Technology, Knowledge and Learning, 22*, 377-384. https://doi.org/10.1007/s10758-017-9314-3

van Roy, R., & Zaman, B. (2018). Need-supporting gamification in education: An assessment of motivational effects over time. *Computers & Education, 127,* 283-297. https://doi.org/10.1016/j.compedu.2018.08.018

Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020). The impact of gamification on learning and instruction: A systematic review of empirical evidence. *Educational Research Review, 30*, Article 100326. https://doi.org/10.1016/j.edurev.2020.100326

Zhu, Y., Zhang, J.H., Au, W., & Yates, G. (2020). University students' online learning attitudes and continuous intention to

undertake online courses: A self-regulated learning perspective. *Educational Technology Research and Development, 68*, 1485–1519. https://doi.org/10.1007/s11423-020-09753-w