

**José Elias Gonçalves Ratinho**

**Os Efeitos da Gamificação na Motivação dos Alunos do Ensino**

**Secundário e Superior: Revisão Sistemática**

Dissertação para obtenção do grau de mestre em Psicologia da Educação



**UNIVERSIDADE DO ALGARVE**

Faculdade de Ciências Humanas e Sociais

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Dissertação orientada por Professora Doutora Cátia Martins



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Todas as inspirações, diretas ou indiretas foram importantes. Realizar uma dissertação de mestrado pode ser sinónimo de ansiedade e de um leque de outras emoções entre as positivas e as negativas. É, por isso, que mesmo quando as coisas não nos correm bem (e não correm sempre bem!) é importante termos em quem nos apoiar.

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Obrigado!

Porque estamos neste lugar desenfreado?

Não sei! Acho que nunca decifrarei

O mundo no qual fui abandonado.



## Resumo

Cientes da necessidade de motivar os alunos para a aprendizagem, os professores investem nas mais variadas estratégias e técnicas, onde os jogos, por se revelarem apelativos e estimulantes, são um exemplo disso, surgindo assim a gamificação na educação. A gamificação refere-se à utilização do *design* dos jogos com o intuito de proporcionar aos utilizadores sentimentos semelhantes aos vivenciados num jogo (i.e., concentração, diversão, competição). Uma aplicação gamificada não é, contudo, um jogo em si, mas sim uma aplicação que utiliza elementos dos jogos (i.e., pontos, tabelas classificativas, níveis, distintivos, entre outros). Esta é uma técnica recente e, apesar de se encontrar associada ao aumento da motivação e do rendimento escolar, investigações acerca da gamificação educativa ainda são escassas e encontram-se, por vezes, dispersas entre áreas, como a educação e a tecnologia. Considerando o estado da literatura, neste estudo, procedemos a uma revisão sistemática de modo a identificar os efeitos da gamificação na motivação para a aprendizagem, independentemente do modelo concetual motivacional utilizado.

Foram identificados 220 artigos, de acordo com palavras-chave previamente designadas, sendo que 23 cumpriram os critérios de inclusão e os restantes 197 foram removidos.

Os resultados da revisão sistemática sugerem efeitos positivos da gamificação na motivação dos alunos, principalmente quando aplicada num curto período de tempo, embora apontem para uma regulação de cariz externo e orientada para o desempenho. No entanto, a relação positiva da gamificação na motivação reduz quando os alunos são expostos a técnicas gamificadas mais a longo prazo. A influência de um efeito da novidade e das características individuais dos alunos no decréscimo motivacional são outra especificidade salientada nos estudos. A gamificação pode ser um recurso

impulsionador da motivação dos estudantes, contudo a sua aplicação em contexto educativo deve ser ajustada às necessidades dos alunos.

**Palavras-chave:** Gamificação; Estratégia Gamificada; Elementos de Jogo; Efeito de Novidade.

## **Abstract**

Students have different interests and learning styles. Also, they are familiar with technology nowadays, sometimes, even more than teachers are. Having this in mind, teachers are changing their teaching methods. Considering games influence in today's student's generation, teachers are introducing more game-like strategies, one of those methods is gamification.

Gamification is the use of game elements in non-gaming contexts to foster a state of gameful experience and evoke the gaming engagement in user of gamified services (eg., points; rankings; badges; avatar; quests). Gamification is not a full-fledged game, instead a gamified resource uses gaming characteristics to engage and motivate students without being a game itself.

Gamification is still in its early days, and it is common to find an association between gamification and motivation in gamification research field. Some studies state that gamification increases student's motivation. However, studies are still growing and the effects of gamification in student's motivation are unclear.

Concerning the uncertainty of gamification research, we conducted a systematic review to verify gamification effects in student's motivation.

220 articles were found in the research, but only 23 studies were selected based on selection criteria.

The results suggest a positive influence of gamification strategies in student's motivation, especially when applied in short-time periods, even if it's an extrinsic and performance-oriented motivation. There is, however, evidence that in a long-term period student's motivation can decrease. Other important factors are the novelty effect and student's characteristics, as those features can also influence student's motivation.

Gamification can be motivational, however gamified designs must be appealing and focus on student's needs.

**Keywords:** gamification; game elements; gameful experiences; novelty effect.

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## Introdução

A tecnologia está cada vez mais presente nas nossas vidas, pelo que uma utilização massiva dos *gadgets* digitais modificou a forma de comunicação humana, sendo que as famílias dispõem uma quantia considerável das suas economias na compra de computadores, *smartphones* e planos de *internet* (Bulman & Fairlie, 2016).

De facto, os meios digitais mudaram a forma como acedemos à informação e, atualmente, as bibliotecas digitais facilitam o acesso a materiais de conhecimento, como os artigos científicos e os livros. Deste modo, o ensino faz uso da massificação da tecnologia e transita de forma gradual do papel para a digitalização (Coelho et al., 2018). Os jovens que nasceram nos anos 90 estão familiarizados com as tecnologias digitais e são considerados nativos digitais, mas, por outro lado, os indivíduos que precederam a era dos meios cibernéticos e dos *gadgets* interativos são, segundo Prensky (2001), denominados de “imigrantes digitais” (p. 3) e podem revelar uma maior dificuldade em desenvolver mestria perante os recursos tecnológicos, quando comparados com os jovens. Ambas estas gerações se encontram nos contextos educativos, embora, por vezes, desempenhando papéis diferentes.

Considerando a presença e a importância que as ferramentas digitais têm no quotidiano, os meios digitais podem enriquecer a aprendizagem e promover o progresso dos alunos (Paula & Valente, 2016; Poshka, 2014). Inserir este tipo de componentes em contexto escolar pode contribuir para o sucesso académico, em parte devido à familiaridade e interesse que os alunos demonstram face aos meios digitais (Kiryakova et al., 2014). Mais ainda, os métodos de ensino tradicionais podem ser complementados com recursos tecnológicos e ajustados às necessidades dos alunos que frequentam atualmente

as escolas (i.e., técnicas de aprendizagem baseadas na internet e estratégias gamificadas; Lo & Hew, 2018).

A sala de aula tem um ambiente complexo e diversificado, que deve acompanhar o avanço das tecnologias e das ciências, que se encontram em constante evolução (OECD, 2018). A tecnologia permite aos alunos uma aprendizagem interativa e um acesso facilitado a recursos científicos (Oliveira et al., 2016), entre outros benefícios. Os jogos, por exemplo, evoluíram com a tecnologia e são utilizados no sistema educativo através de técnicas como a aprendizagem baseada nos jogos, os jogos educativos, a gamificação ou os *serious games* (Ouahbi et al., 2017). Existe, portanto, um vasto leque de abordagens educativas inspiradas na tecnologia e na diversão, que se encontram em franca exploração nestes contextos.

A utilização de recursos pedagógicos digitais e interativos tem vindo a crescer devido às suas características imersivas e estimulantes. A motivação associada a técnicas como a aprendizagem baseada nos jogos ou a gamificação tem, por norma, uma abordagem mais externalizada (Hanus & Fox, 2015). As estratégias gamificadas, por exemplo, procuram motivar os alunos através de recompensas, como o desbloqueio de distintivos ou a obtenção de pontos, que se traduzem numa classificação elevada na tabela classificativa. Este tipo de recursos procura envolver e motivar os alunos através de uma abordagem apelativa e ajustada aos passatempos dos estudantes (Deterding et al., 2011).

Tendo em conta a cultura tecnológica e de videojogos dos jovens atuais, pretendemos, neste estudo, explorar o papel da gamificação na educação. A gamificação tem sido cada vez mais utilizada como recurso pedagógico, contudo, os efeitos da gamificação na motivação dos alunos para a aprendizagem não são consensuais. Com o objetivo de se perceber os efeitos motivacionais que a gamificação provoca nos estudantes, os métodos de gamificação mais recorrentes e os instrumentos psicométricos

validados mais utilizados para avaliar os efeitos motivacionais da gamificação, procedemos a uma revisão sistemática da literatura. A seleção desta técnica deve-se ao facto de permitir realizar um rastreamento de estudos já realizados acerca do tema que pretendemos explorar e facilita a compreensão dos resultados obtidos nos estudos efetuados.

# **Capítulo I – Enquadramento teórico**

## 1.1. A Utilização dos Jogos na Educação

O jogo está presente na vida do Homem desde sempre e é a primeira forma de aprendizagem com a qual tem contacto (Alves & Biachin, 2010). Tem o potencial de auxiliar as crianças no seu desenvolvimento enquanto ser humano (Cardia, 2011), através de brincadeiras de jogos de papéis, por exemplo, que permitem uma melhor interiorização e um conhecimento mais concreto do mundo exterior (Alves & Biachin, 2010; Cordazzo & Vieira, 2007; Fahel & Pinto, 2018).

O interesse pelo jogo deve-se à possibilidade de imersão que este tipo de atividades permite: quando um indivíduo embarca num jogo, atinge estados de atenção e envolvimento muito profundos (*flow*) (Silva et al., 2015). O *flow* ou estado de fluxo, apresenta componentes que são representativas dos interesses de qualquer indivíduo. Um indivíduo que esteja em estado de fluxo encontra-se tão focado e concentrado que perde a noção do tempo, isso acontece devido ao êxtase que certa atividade proporciona. De uma forma geral, esta abordagem recorre aos constructos de aborrecimento e ansiedade, aleando-os ao desafio e à habilidade pelo que, sempre que um sujeito apresenta elevado nível de habilidade e de desafio proposto, estaremos perante elevados níveis de concentração, sendo consideravelmente reduzida a probabilidade de aborrecimento perante a tarefa (Csikszentmihalyi, 1997). Quer isto dizer que, um aluno que entre neste estado de fluxo está muito motivado perante a tarefa que está a executar e sente que as suas habilidades estão em sintonia para com o que se encontra a realizar (Silva et al., 2015).

Devido à contribuição que as atividades lúdicas podem desempenhar no sucesso escolar, os jogos pedagógicos, por exemplo, podem ser importantes para o aumento do interesse nas atividades escolares, podendo assim influenciar o desempenho escolar de uma forma significativamente positiva (Araújo & Carvalho, 2018; Orlandi et al., 2018).

Nos últimos anos, tem surgido uma técnica de aprendizagem através dos jogos e da sua mecânica (i.e., tabelas classificativas, pontos, níveis) denominada aprendizagem gamificada ou gamificação. A gamificação é um conceito recente e emergente, que aos poucos vai sendo explorado no sistema escolar (Deterding et al., 2011). Se bem aplicada, a gamificação fomenta a motivação e, por conseguinte, pode proporcionar altos níveis de envolvimento aos alunos, que resultarão em maiores níveis de motivação em relação às tarefas escolares (Zichermann & Cunningham, 2011).

## **1.2. A Gamificação**

A gamificação é um conceito relativamente recente e os autores que tentam definir esta abordagem educacional (e.g., Deterding et al., 2011; Hamari et al., 2014; Kapp, 2012) identificam-na como a utilização de elementos dos jogos em contextos alienados aos jogos (Deterding, Dixon, Khaled, & Nacke, 2011). No caso da educação, esta seria a utilização de mecânicas e dinâmicas dos jogos como recursos para estimular os alunos no seu processo de aprendizagem.

Para Kapp (2012), a gamificação diz respeito à utilização das mecânicas, da estética e do pensamento dos jogos de forma a estimular os alunos para a aprendizagem. Neste sentido, a gamificação e os jogos educacionais podem ser facilmente confundidos; no entanto, enquanto os jogos educacionais dizem respeito à utilização do jogo em contexto e com propósito educativo, a gamificação é a utilização das mecânicas dos jogos (i.e., enquanto estratégia) noutros contextos como, por exemplo, os organizacionais (Al-Azawi et al., 2016). A gamificação não se restringe, contudo, à utilização de elementos de jogos, uma vez que a necessidade de pontuar ou progredir não é tão importante para alguns jogadores como, por exemplo, o sentimento de mestria e a socialização (Kapp, 2012).

Werbach (2014) contribuiu para o constructo de gamificação, concordando que seria rudimentar definir a gamificação como a utilização de elementos dos jogos. Para o autor, os exames escolares, por exemplo, apresentam pontuação, mas não devem ser mencionados como uma atividade gamificada, pois, caso tal acontecesse, o conceito de gamificação deixaria de ter sentido e todo o processo educativo, como transitar de ano, similar aos níveis, já seria, de base, um serviço gamificado. O autor sugeriu que a gamificação fosse definida como a tentativa de proporcionar uma sensação de jogo através de aplicações que não são jogos.

Mais tarde, Huotari e Hamari (2017) definiram a gamificação como o processo de aprimoramento de um serviço através do recurso a experiências dos jogos, com o objetivo de auxiliar os seus utilizadores, indo muito para além da utilização de elementos de jogos. Os elementos dos jogos não estão devidamente identificados e a simples inserção de pontos num determinado serviço não garante, por si só, que os utilizadores experienciem o mesmo sentimento que atingem ao jogar um determinado jogo. No entanto, a inserção de elementos dos jogos pode, de facto, facilitar o desenvolvimento de uma técnica gamificada.

Landers e colaboradores (2018) seguiram a linha de definição mais recente (Huotari & Hamari, 2017; Werbach, 2014) e concluíram que existem três condições inerentes à sensação proporcionada pelos jogos: (1) numa experiência de jogo os sujeitos devem percecioner os objetivos como sendo atingíveis, mas não triviais; (2) as regras são impostas por agentes externos; e (3) os utilizadores devem sentir-se autónomos perante a atividade (3). Esta terceira condição sugere que os videojogos são procurados pelo forte sentido de autonomia proporcionado. Assim, estas três características devem ser experienciadas para que seja atingido um sentimento de jogo numa atividade gamificada;

caso uma das três condições não esteja presente, o sentimento de experiência de jogo pode não ser atingido.

No mesmo sentido, para Högberg e colaboradores (2019) existem sete dimensões de uma sensação de jogo: realização, desafio, competição, orientação, imersão, diversão e experiência. Para os autores, se as aplicações gamificadas proporcionarem estas condições aos seus utilizadores, então, o processo de gamificação será mais eficaz e condizente com a sensação proporcionada pelos jogos.

No que se refere à sua aplicação em contexto educativo, Stott e Neustaedter (2013) e Jakubowski (2014) identificam o trabalho de Lee Sheldon em 2010, um professor com experiência no ramo dos videojogos, no que diz respeito ao seu sistema de pontuação educativo criado com base nas mecânicas dos jogos, razão pela qual foi considerado pioneiro nesta aplicação. O seu sistema de avaliação é baseado em tabelas classificativas, componente comum dos jogos, e permite que o aluno obtenha uma maior perceção do seu nível escolar e dos seus progressos (Stott & Neustaedter, 2013). Este tipo de estratégias, com base na acumulação de pontos, pode incentivar a aprendizagem e possibilitar um progresso visível ao nível do desempenho escolar (Araújo & Carvalho, 2018; Goehle, 2013; Stott & Neustaedter, 2013).

A gamificação tem vindo a ser integrada, lentamente, nas práticas educativas e revela-se essencial em fatores fulcrais do sucesso educativo, como a motivação ou o envolvimento nas tarefas (Araújo & Carvalho, 2018). A aprendizagem gamificada é facilitada através dos *gadgets* digitais e da utilização de conceitos dos jogos, como as tabelas classificativas, os níveis, os pontos, as recompensas (Hamari et al., 2014), os distintivos (Anderson et al., 2013), as aventuras/desafios (Zichermann & Cunningham, 2011) e as narrativas (Stott & Neustaedter, 2013).

O uso de técnicas de gamificação pode, efetivamente, colaborar para o sucesso do ensino (Orlandi, et al., 2018). No contexto educacional, aspetos dos jogos, como a repetição, os ciclos rápidos de respostas, os níveis crescentes de dificuldade, as diferentes possibilidades/alternativas e a recompensa, podem ser importantes para a aprendizagem escolar (Simões et al., 2013). A gamificação desenvolve a curiosidade dos alunos e estimula-os a participar mais nas tarefas (Kirillov et al., 2016). Desta forma, o uso de aplicações gamificadas pode, igualmente, incentivar os alunos a desenvolverem um sentido crítico mais apurado na resolução de problemas (Khaddage & Lattemann, 2016). Neste sentido, um dos pontos fortes da gamificação reside na utilização de desafios ótimos, em que a aprendizagem influenciada pelos jogos procura desafiar os estudantes através de tarefas que não sejam muito simples ou complicadas para o aluno e, deste modo, se a tarefa estiver ajustada às habilidades e ao nível escolar dos alunos, o envolvimento e o interesse pela atividade serão aumentados (Högberg et al., 2019; Kirillov et al., 2016; Landers et al., 2019; Savi & Ulbricht, 2008).

Em termos motivacionais, elementos de jogos como os pontos e as tabelas classificativas podem ser vistos como fatores de motivação extrínseca, mas, por outro lado, um aluno que seja bem-sucedido irá se sentir competente.

Os contributos motivacionais proporcionados pela gamificação educativa podem ser estudados através das teorias motivacionais, para que se possa perceber os benefícios da gamificação da aprendizagem (Sailer et al., 2013). Contudo, os estudos sobre os efeitos motivacionais da gamificação numa perspetiva psicológica e com recurso a instrumentos psicométricos validados são escassos (Hamari et al., 2014; Sailer et al., 2017; Seaborn & Fels, 2015). Nos últimos anos, esta lacuna tem vindo a ser preenchida (Sailer & Homner, 2020). No entanto, os resultados obtidos não são consensuais em relação à eficiência da

gamificação enquanto estratégia pedagógica motivadora (Sailer & Homner, 2020; Zainuddin et al., 2020).

## **Capítulo II – Revisão Sistemática**

# **The role of gamified learning strategies in student's motivation in high school and higher education: a systematic review**

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## **Abstract**

The gamification, defined as the integration of (video)game components to promote a gameful experience, is being implemented in education aiming to enhance students' engagement and motivation. Therefore, since 2010, this is an area of growing interest for researchers and teachers.

A systematic review was conducted in April 2020 aiming to explore the influence of gamification strategies in student's motivation to learn. 220 articles were found, but only 23 studies were selected based on selection criteria. Studies revealed that game elements as points, badges and rankings are widely used to try to engage and motivate students. From a theoretical perspective, gamification studies focus on the dichotomy intrinsic and extrinsic motivation. The results suggest a positive influence of gamification strategies in student's motivation, however, in a long-term period, student's motivation can decrease. The results propose the influence of a novelty effect and extrinsic rewards on motivation, which can lead to higher levels in a short period, followed by a decrease in a longer gamification exposure.

Future studies should focus on student's traits (e.g., gaming experience, openness to competition and cooperation) influence on gamification strategies. Also, factors as long-term exposure and the novelty effect should be explored.

**Keywords:** gamification; game elements; gameful experiences; novelty effect.

## Introduction

The term “*gamification*”, highly associated with technology, begins in the 2000s (Sailer et al., 2017) and, allegedly, it was Nick Pelling that, in 2002, introduced the concept to the world (Yıldırım & Şen, 2019). Also, in 2002, Benthem proposed that any logical task could be gamified (Landers, 2014) and Bret Terrill, in 2008, referred the word *gameification* in his blog as a strategy to improve engagement (Huotari & Hamari, 2012) but, unfortunately for him, his spelling of the word did not stick. Mainly, the interest in gamification started to grow in 2010 (Deterding et al., 2011) in areas as business (e.g., Bajdor & Dragolea, 2011; Gears & Braun, 2013), health (e.g., Wylie, 2010), education (e.g., Jakubowski, 2014; Landers, 2014; Stott & Neustaedter, 2013) and crowdsourcing (e.g., Morschheuser et al., 2017).

Gamification is defined as the use of (video) games elements in contexts that are not game-related (e.g., enterprises, schools) (Deterding et al., 2011). To define gamification in learning, Landers (2014) developed the theory of gamified learning, which refers to gamification in education as a process of using game attributes in educational settings to influence student’s behaviours and attitudes.

Although game design elements can be hard to identify and since there is not a consensus about a specific list of its features (Deterding et al., 2011; Hamari et al., 2014; Huotari & Hamari, 2017; Werbach & Hunter, 2012) Deterding and colleagues (2011) suggested five different levels : (1) *Game interface design patterns* (e.g., badges, leaderboards, points, levels); (2) *Game design patterns and mechanics* (e.g., time constraint, limited resources, turns); (3) *Game design principles and heuristics* (e.g., enduring play, clear goals, variety of game styles); (4) *Game models* (e.g., challenge, fantasy, curiosity); and (5) *Game design methods* (e.g., playtesting, playcentric design, value conscious game design). But way before that, Thomas Malone (1980) mentioned

challenge, curiosity and fantasy as key-game elements. Another proposal is the Mechanics, Dynamics and Aesthetics framework (MDA; Hunicke et al., 2004, Werbach & Hunter, 2012), that, as the name define, splits game elements in mechanics, dynamics and aesthetics (Kim & Lee, 2015). These different game elements perspectives can help designers to understand the effects of game elements in learning environments (Kusuma et al., 2018). However, the implementation of game elements itself does not necessarily promote the levels of engagement as videogames do (Werbach, 2014). Therefore, some people do not play games to climb leaderboards or to gain badges and points, instead they do it to acquire competence in certain tasks or to connect with their friends (Kapp, 2012).

Also, users of gamified services must feel engaged to the design as they connect to (video) games (e.g., Kapp, 2012; Werbach, 2014). Therefore, Huotari and Hamari (2012), instead of focusing on the implementation of game design elements, suggested that gamification designers should provide gameful experiences to users when creating gamification strategies. Consequently, the most recent definitions of gamification identify gameful experiences as the goal of gamification (e.g., Huotari & Hamari, 2017; Werbach, 2014), that is an enhancing process to promote gameful experiences; if not, the gamified design will not attain its purpose (Huotari & Hamari, 2012, 2017).

A gameful experience can be understand as a psychological state resulting from the interaction of a perceived achievable and non-trivial goal with the feeling of autonomy, leading to high levels of involvement (Landers et al., 2019). When using a gameful service, the user must feel autonomous and motivated to follow instructions and the activities must be tangible, but not too hard nor too easy to accomplish (Högberg et al., 2019; Landers et al., 2019). This conceptualization is matchable with the construct of flow, a psychological state introduced by Csikszentmihalyi (1997) to describe high feelings of immersion in certain activities, identified as crucial to lead gamified design

users to a gameful experience (Högberg, et al., 2019). The flow state main characteristic is the involvement and enjoyment of the activity; the level of absorption is so intense that people experiencing flow, often lose track of time. The engagement provided by the state of flow is an example of successful games and gameful experiences and, for this reason, an important factor of gamified design. In fact, the immersion inherent to a state of flow is identified as one of the most important factors of gamification success, along with accomplishment, challenge, competition, guidance, playfulness and social experience (Högberg et al., 2019). The authors believe that if users fulfil these factors in a gamified design, a gameful experience will be achieved and benefice the performance in different contexts, for example, a student will be more engaged and motivated to complete tasks.

## **Gamification in Education**

Classrooms are complex, in part due to students' different aspirations and learning skills. It is central that teachers keep track of student's needs, technology and science evolution (OECD, 2018). In education, technological tools are being incorporated in classrooms, as, for example, gamification. However, there are other practices inspired in games that are popular in education [e.g., serious games, game-based learning, 3D simulations, virtual reality (VR)].

Besides gamification, one can also find game-based learning and serious games as educational games techniques and thus, it is important to distinguish the three concepts: *gamification* integrates game elements to provide gameful experiences without being a game itself (Deterding et al., 2011; Högberg et al., 2019; Huotari & Hamari, 2017; Werbach, 2014); *game-based learning* concerns to the application of a full-fledged educational game to motivate students (Plass et al., 2015) and *serious games* are defined as a way of combining real world and games through simulations that aim to develop

certain competences in a safe and lower cost environment (Michael & Chen, 2006). The approaches are not the same, but all are supported by games and aim to boost the motivation and academic performance in a fun perspective of learning (Al-Azawi et al., 2016).

In the learning gamification field, an important author is Lee Sheldon (2012), a professor with a gaming development experience: he was a pioneer in the application of gamification techniques, with a class system based in game elements. In his experience, grades were achieved according to the progression of students through points and places in leaderboards (Jakubowski, 2014; Stott & Neustaedter, 2013). As a result of this work, gamification techniques became popular in the educational setting and platforms and applications were successfully developed, as Khan Academy (Morrison & DiSalvo, 2014), Codecademy (Sharp, 2019), WeBWorK (Goehle, 2013) and Kahoot! (Alabassi, 2017).

In the education setting, gamification is often applied to promote engagement and motivation in the learning process, since they make the progress clear (Araújo & Carvalho, 2018; Stott & Neustaedter, 2013). Advances in technology boosted the use of gamification in this context since gadgets, as tablets and smartphones, have simplified the integration of gamified services (Oliveira et al., 2016). To promote a game-like experience, the gamified services are rich in game elements as *rankings*, *levels*, *points*, *rewards* (Hamari et al., 2014), *badges* (Anderson et al., 2013), *quests* (Zichermann & Cunningham, 2011) and *storytelling* (Stott & Neustaedter, 2013).

Gamification strategies can foster competition and/or cooperation. Competition is a crucial factor in learning and students are often encouraged to compete, aiming higher grades or status (Stansbury & Earnest, 2016). In opposition, cooperation can improve important skills, as teamwork (Buckley & Doyle, 2016). For some students, competition

can become demotivating: in gamification strategies, leaderboards can be a frustrating feature, especially if students find themselves with lower classifications in the ranking (Hanus & Fox, 2015; Werbach & Hunter, 2015). Having this in mind, educational gamification can be motivational, but can also lower student's motivation. Gamification is often suggested as an appealing strategy that improves motivation and engagement (Deterding et al., 2011). However, more studies are needed to understand the motivational learning effects of gamification (Hamari et al., 2014; Sailer et al., 2017). Also, some research suggested a decrease of motivation after a gamification exposure (Hanus & Fox, 2015; Tsay et al., 2018).

Education is one of the most explored contexts of gamification and most studies suggest a positive influence of gamified learning strategies in student's motivation (Majuri et al., 2018; Seaborn & Fels, 2015). Despite that, it is important to track the psychometric instruments used to measure motivation and understand gamification effects in student's motivation. Also, it is interesting to explore gamification effects in high school and college student's motivation (Manzano-León et al., 2021). College students frequently miss classes (Papp, 2017) and high school students reveal high levels of anxiety and dropouts. Gamification could contribute positively to college student's motivation (Laubersheimer et al., 2016) lower the poor attendance rates and help to reduce high school student's anxiety levels and dropouts (Dichev et al., 2014). We believe that a systematic review can contribute to future studies of gamification effects on student's motivation and help teachers introduce the most efficient gamified learning strategies.

The present study aims to explore the following:

- (1) Instruments used to assess gamified learning strategies and features in higher and high school settings;

(2) Gamified learning strategies and features most used in higher and high school settings;

(3) Gamified learning strategies and features effects in higher education and high school student's motivation.

## **Methodology**

The systematic review (SR) is a widely used method for literature research, that comprise a rigorous structure of action to contribute with a beyond analysis (Harris et al., 2014). It allows confirmation or refutation of theories and identify gaps that can inform future research (Munn et al., 2018). Considering this method advantages, we believe this review may be very useful for researchers and teachers to enhance the adequate use of gamified strategies.

## **Procedure**

This SR research was conducted in April 2020 and searched for studies in Web of Science, Eric and PsycInfo, between 2013 and 2020.

The following keywords were used: Gamification OR gamified OR gameful experience (only title); Education OR Learning; Motivation OR self-efficacy OR self-determination OR Autonomy; High School OR college OR higher education OR University. The words “gamified” and “gameful experience” are in line with the most recent definitions of gamification (Högberg et al., 2019; Huotari & Hamari, 2017; Werbach, 2014).

## **Inclusion and Exclusion criteria**

As inclusion criteria we designate the following: quantitative studies, English as main language, papers exploring gamification features, articles evaluating motivation

variables (e.g., self-determination, self-efficacy or autonomy), samples of high school or higher education students and school or academic learning environments.

We did not include outcomes that meet the following requirements: literature review, qualitative studies, thesis, books; gamification studies in areas beyond learning contexts; studies that do not include motivational variables; samples composed by participants that are not high school or higher education students; studies that are not published in the English language; research that only considered educational games, serious games, game-based learning OR/AND virtual simulations.

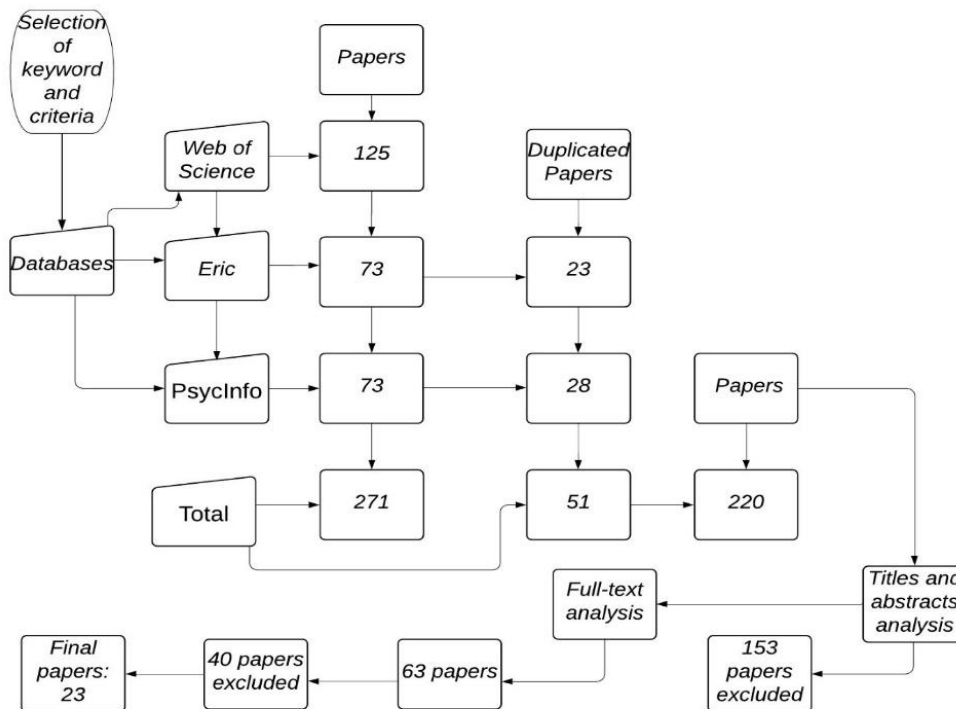


Figure 1. Flowchart of Systematic review.

### Studies Selection

As Figure 1 shows, we found 271 articles, but 51 papers were duplicated, leaving 220 articles to analysis. The Web of Science provided 125 articles and databases Eric and PsycInfo identify 73 articles each.

After a first analysis of titles and abstracts, we removed 153 papers (Table 1). The remaining 63 articles full texts were examined. After this first exploration, 40 studies were also removed because they did not meet the inclusion criteria, leaving 23 studies as analysis *corpus* in this systematic review.

**Table 1. Justification for excluded articles.**

Exclusion criteria	<i>N</i> = 197
Literature reviews	34
Not gamification in learning contexts	10
Motivational aspects of gamification not explored	90
Higher education or high school samples not included	27
Not published in English language	15
Use other forms of educational games (e.g., game-based learning; serious-games; simulations)	21

## Results

In the SR, 23 studies were included, some are cross-sectional (6), but the majority are longitudinal studies (17), and 9 compared a control group to an experimental group. The United States of America published the most (6), followed by Turkey (3) and Spain (2), however 15 countries are represented (Table 2). This data indicates a global interest in gamification research.

**Table 2. Countries of the publications ( $n = 15$ ).**

<b>Study from (Nation)</b>	<b><i>N</i></b>
United States of America	6
Turkey	3
Spain	2
Saudi Arabia	1
Ireland	1
Jamaica	1
Canada	1
Lithuania	1
Germany	1
Singapore	1
Ecuador	1
Serbia	1
Taiwan	1
Belgium	1
Hong Kong	1
<b>Total = 15 Countries</b>	<b>Total of Papers = 23</b>

In terms of participants, the studies vary between 22 and 683 students ( $M = 138.2$ ,  $SD = 148.1$ ) most students are currently studying in higher education courses as informatics, technology, science, programming, communication, arts, psychology, engineering, politician education or physics. Even if some studies do not report age or gender, there is a tendency to include more males than females in the gamification

research. This may be because most participants are from courses as engineering and programming.

**RQ1: Instruments used to assess gamified learning strategies and features in higher and high school settings.**

Intrinsic Motivation Inventory (IMI; Ryan et al., 1991) is one of the most used instruments to measure the influence of gamification in student's motivation [6; 7; 9; 10; 12; 15; 22]. This instrument assesses: Enjoyment, Perceived Competence, Pressure/Tension, Perceived Choice and Value/Utility (SDT; Deci & Ryan, 1985, 2000; Ryan & Deci, 2000). Both intrinsic and extrinsic motivation are within the most explored motivational outcomes of gamification (Seaborn & Fels, 2015). Therefore, Academic Motivation Survey (Vallerand et al., 1992) [4; 18], Academic Self- Regulation Questionnaire (Müller et al., 2007) [13], Student's Perceived Levels of Competence, Autonomy and Relatedness in a Gamified Flipped Class [23] and Gamified Social Platform questionnaire [5] were also used to measure gamification effects in this perspective.

Another set of instruments include Self-efficacy and Learning Outcomes questionnaire [19] and Patterns of Adaptive Learning Scales (Midgley et al., 2000) [1] from the Approach-Avoidance Achievement Theory (Atkinson, 1957; Dweck & Elliot, 1983). This theory concerns the dichotomy approach-avoidance; so, basically, if an activity gives positive feelings, a person tends to keep doing it (approach motivation). On the other hand, if certain task is undesirable and associated with negative emotions, a person will avoid the task (avoidance motivation). In addition, this theory states that students are motivated from a performance or mastery perspective; for example, a student engaged in a task for the sake of learning is mastery-oriented, but when grades are the most important factor, student is performance-oriented (Elliot, 2006).

Motivation Scale Course Interest Survey [14; 16] and Gamification Software Engineering Education Learning System (GSEELS) questionnaire [21] explored student's motivational levels through Keller's motivational ARCS model (Keller, 1984; 1987). The ARCS model focuses on the appealing of academic tasks and states that in order for an academic task be motivating, four conditions should be fulfilled: (1) Attention; (2) Relevance; (3) Confidence; (4) Satisfaction.

Other studies explored student's motivational levels focusing on gamification features, instead of measuring motivation through specific theories [2; 3; 8; 11; 17; 20]. Positive, Cognitive, Psychological and Instant Feedback Effects of Gamification scale [2] measure the cognitive and psychological effects of game elements in student's motivation, instant feedback and sense of community. Another scale, adapted from School Social Behavior Scale (SSBS; Yukay-Yuksel, 2009) [8], measured learning achievement, learning anxiety, motivation and autonomy within a gamification and flipped learning study. Online Venture Challenge questionnaire [11] assesses gamification effects on student's experience and affective response (e.g., enjoyment), engagement and self-efficacy. Feedback Answers on Badges and Leaderboards questionnaire [17] explored student's classes attendance and academic motivation through badges and leaderboards implementation. Perceived Experience [20] explored gamification effects in student's motivation in a general perspective, along with features as enjoyable, engaging, fun, boring, challenging and relevant. Science Motivation Questionnaire (Glynn et al., 2009) was the instrument used to understand physics class motivational student's effects of gamification. This instrument has been adapted specifically to a gamified physics learning.

To sum up, some authors developed and adapted scales to explore motivation's outcomes of gamification [2; 8; 11; 17; 19; 20; 21; 23]; others used instruments inspired

by motivational theories, as Self- Determination [4; 5; 6; 7; 9; 10; 12; 13; 15; 18; 22; 23], which was one of the most popular, as it was the case of Intrinsic Motivation Inventory (Ryan et al., 1991), used in 12 studies. In addition, the Approach-Avoidance motivational theory [1; 19] and Keller's motivational ARCS model [14; 16; 21] were also explored to evaluate the influence of gamification in student's motivation to learn.

## **RQ2: Gamified learning strategies and features most used in higher and high school settings.**

Educational gamified learning strategies are based on platforms and applications that use games elements, especially, *points* [1; 6; 9], *rankings* [2; 5; 11] and *badges* [12;13; 18]. Other videogames characteristics explored in gamification learning strategies are, for example, *storytelling*, *levels*, *boss fights*, *easter eggs* [6] and *roleplay* [20; 21].

We found a variety of platforms that were used in educational settings. "Gradecraft" [1], a digital software that allows the integration of badges and points in academic tasks is one of them. This software allows students the possibility to repeat tasks, leading them to autonomy and freedom to try until they succeed. A similar platform is "EchoLu" [6], an online service with *progress bars* that rewards students with *badges* for successful tasks. A rapid response system named "Kahoot!" [2], an application that turns the classroom in a competition show, was used to engage students in the learning process. The platform is a booster of competition and rewards students with the most correct and faster answers with a higher place in the leaderboard. "Who Wants To Be A Millionaire" and "Codeacademy", also rapid response system platforms, were explored in researches. The use of quizzes platforms designed with game elements like *leaderboards* and *points* seems to be a widely explored method of gamified learning strategies [e.g., 3; 13; 15; 19].

Some gamification experts [e.g., 10; 21; 22] developed gamified platforms to promote student's motivation in learning. In the App "The Protégé" [22], for example, inspired in 2D videogames, students must answer questions to progress in the narrative. Even if platforms and applications of gamification are the preferred method in educational gamification design, designers can also integrate game elements in Moodle website. This can be applied with the use of plugins allowing the inclusion of *badges* or *points* into the Moodle platform, to reward students for participation in a forum [3; 7] or for the lecture of articles and presentations [12;16]. For example, in one study [18] points and *badges* were applied in Google+ to explore gamification.

In overall, there is evidence of several types of gamified designs and techniques used in educational settings, that vary from simple approaches, as integrating some badges or points [3; 7; 12; 16], while other [10; 21; 22] are more creative and include complex games features (e.g., *roleplay*, *avatars*, *easter eggs*, *boss fights*, *quests*).

### **RQ3: Gamified learning strategies and features effects in higher education and high school student's motivation.**

Gamification learning strategies are being slowly incorporated into classrooms and studies of gamification techniques effects on student's motivational are growing. A study [11] explored the novelty effect in gamification (defined as a pattern of high activity during the initiation of a gamified process, followed by a drop of activity after the novelty of the gamified activity disappeared; Tsay et al., 2019). In their longitudinal study, the authors suggested that student's intrinsic motivation could decrease due to a long exposure to gamified learning strategies. The results alert for a negative association between gamification and students' academic performance, especially in a long period. Therefore, gamification can be powerful in a short term, however, when the novelty effect disappears, the extrinsic reward system of gamification tends to reduce student's intrinsic

motivation and even their grades can decline [7; 9; 13; 18]. In another study [19], a decrease of student's motivation has been reported after a gamified experience; however, in the control group, student's motivation also diminished, suggesting that the reduction of motivation could not be directly influenced by gamification, and other factors, for example, individual differences (e.g., self-efficacy beliefs), could be crucial.

The opposite also has been reported, since there are longitudinal studies that suggest a positive influence of gamified learning strategies on student's motivation. Points and badges were implemented in a longitudinal study of three years [1]. In each year, the benefits of the gamified course were evident in every class, student's autonomy and perceived competence increased, and the participation in class task was positive. A similar study was conducted and concluded that student's self-efficacy, engagement and motivation levels were higher when compared to classes of previous years that did not experience a gamified learning strategy [11]. A study [18] used a competitive gamification technique through the App "Who Wants To Be A Millionaire" and found that student's levels of immersion in the activities were high, leading to higher motivation and participation in classroom tasks.

On the other hand, the cross-sectional studies reported high levels of student's motivation [2; 5; 6; 16; 19], which can indicate that students are engaged and motivated to use the gamified apps. In fact, when gamification is applied in a short time, gamified experience groups are, usually, more motivated than the control group, generally following a traditional learning method [2; 5; 16; 19].

In general, a decrease in student's motivation was reported in five studies [7; 9; 13; 17; 18], all of them had longitudinal designs and propose an influence of the novelty effect and individual differences. However, most of the studies in this review reported an

increase of student's motivational levels, showing that gamification regularly benefits student's motivation, at least how it is measured.

**Table 3. Characterization of included articles ( $n = 23$ ).**

Nr.	Authors (Year)	Sample size	Education Level	Type of Study	Motivation Instruments	Gameful design	Gamification effects on Motivation
1	Aguilar, Holman, and Fishman (2018)	683	Higher (Undergraduate courses)	Longitudinal	Patterns of Adaptive Learning Scales (Midgley et al., 2000)	Points, badges, cooperation and competition	Autonomy and competence increased in students that felt in control over the gamification grading system.
2	Alabassi (2017)	47	Higher (Technology)	Cross-sectional	Positive, Cognitive, Psychological, and instant feedback effects of gamification (Alabassi, 2017)	Badges, points, leaderboards and competition	Student's motivation, engagement and satisfaction were high after a gamified learning intervention. Instant feedback had an impact in learning motivation, participation and academic achievement.
3	Asiksoy(2017)	61	Higher (Physics)	Longitudinal with control group	Science Motivation Questionnaire (Glynn et al., 2009)	Points, badges, leaderboard and competition	Student's motivation in the experimental group (gamification) was higher compared to the control group (flipped course).
4	Buckley and Doyle (2016)	156	Higher (Several graduation courses)	Longitudinal	Academic Motivation Survey (Vallerand et al., 1992)	Coins, trading, competition and cooperation	Intrinsic motivation was found to be high within students in the gamification strategy. Extrinsic motivation was associated with a positive participation in the gamification tasks.
5	Cabot et al. (2020)	27	Higher (Master of Science)	Cross-sectional with control group	Gamified Social Platform (Engagement; motivation; involvement) (Cabot, 2020)	Badges, points, leaderboards, competition and cooperation	Students felt the gamified platform as more motivating and an easy tool to learn, when compared to the control group. The social features of gamification (e.g., cooperation, participation in forums) were an important influence in the higher motivational levels.
6	Ding (2019)	70	Higher (Politician Education)	Cross-sectional with control group	Intrinsic Motivation Inventory (Ryan, 1982)	Badges and points	Students aware of gamification felt higher sense of community, participation and cognitive thinking.

Nr.	Authors (Year)	Sample size	Education Level	Type of Study	Motivation Instruments	Gameful design	Gamification effects on Motivation
7	Facey-Shaw et al. (2020)	360	Higher (Programming)	Longitudinal with control group	Intrinsic Motivation Inventory (Ryan, 1982)	Badges, points, leaderboards and competition	Student's intrinsic motivation from the gamified group decreased after the exposure to badges. Some students claimed being frustrated and demotivated trying to unlock badges. However, in the control group student's intrinsic motivation did also decrease. Authors suggested an influence of programming tasks complexity.
8	González et al. (2020)	60	High (Secondary school)	Longitudinal with control group	School Social Behavior Scale (SSBS) adaptation (Yukay-Yuksel, 2009)	Not specified	A comparison between gamified learning and flipped learning showed that both techniques could increase student's motivation and autonomy and decrease learning anxiety.
9	Hanus and Fox (2015)	80	Higher (Communication)	Longitudinal with control group	Intrinsic Motivation Inventory (Ryan, Koestner, & Deci, 1991)	Leaderboards, points, badges, competition and coins	Student's motivation decreased after an exposure to gamification. The decrease in motivation was due to the competitive features of gamification (e.g., rankings) and to the long exposure to gamification.
10	Hazan et al. (2018)	91	Higher (Psychologic Statistics)	Longitudinal with control group	Intrinsic Motivation Inventory (Ryan, 1982)	Leaderboards, points, badges, avatars, storytelling, instant feedback, cooperation and competition	Gamified condition led students to higher intrinsic motivation (perceived competence, interest/enjoyment, effort/importance) than the traditional learning condition. Motivational levels of students in the gamified condition were higher after the gamification strategy.
11	Isabelle (2020)	279	Higher (Arts and Commerce)	Longitudinal	Online Venture Challenge questionnaire (Isabelle, 2020)	Badges, points, leaderboards, competition and cooperation	The gamified course increased student's motivation and self-efficacy.
12	Jurgelaitis et al. (2018)	132	Higher (Informatics)	Longitudinal with control group	Intrinsic Motivation Inventory (Ryan, 1982)	Badges, points, leaderboards, competition, cooperation, levels, coins and trading	Gamified group was more intrinsically motivated than the control group. Interest/Enjoyment subscale was the most positively influenced by gamification.
13	Kyewski and Krämer, (2018)	159	Higher	Longitudinal	Academic Self-regulation Questionnaire	Badges	Student's motivation level decreased in the gamified group but also in the control group (non-gamified).

Nr.	Authors (Year)	Sample size	Education Level	Type of Study	Motivation Instruments	Gameful design	Gamification effects on Motivation
			(Several graduate courses)		(Müller, Hanfstingl, & Andreit, 2007)		
14	Mese and Dursun (2019)	63	Higher (Information Technologies in Education)	Longitudinal	Motivation Scale–Course Interest Survey (Keller, 1987)	Badges, points, leaderboards and competition	Results of motivational levels (attention - relevance; confidence – satisfaction) were good and similar in both gamified group and control group. Qualitative analysis revealed an increase of motivation in the gamified group through the gamified experience; however, some students reported negative feelings with the experience due to lower places in the leaderboard and failures in the system.
15	Ortiz-Rojas et al. (2019)	89	Higher (Programming)	Longitudinal with control group	Intrinsic Motivation Inventory (Ryan, 1982)	Leaderboards, points and competition	Student’s intrinsic motivation (interest/ enjoyment) did not increase in the gamified and control group. There was no difference between groups neither a significant increase nor reduction of motivational levels.
16	Ozhan and Kocadere (2019)	40	Higher (Undergraduate courses)	Cross-sectional	Motivation Scale–Course Interest Survey (Keller, 1987)	Storytelling, levels, badges, leaderboards, competition, boss fights and rewards	Authors explored the effects of flow and emotional engagement on motivation (ARCS model variables) through gamification. The results suggested an increase of motivation when students were more engaged and experienced flow.
17	Pinter et al. (2020)	282	Higher (Undergraduate)	Longitudinal with control group	Feedback answers (badges; leaderboards) (Pinter et al., 2020)	Leaderboards, points, badges and competition	Students in the gamified group found badges and leaderboards to be motivating.

Nr.	Authors (Year)	Sample size	Education Level	Type of Study	Motivation Instruments	Gameful design	Gamification effects on Motivation
18	Roy and Zaman (2018)	40	Higher (Master students)	Longitudinal	Academic Motivation Scale (Vallerand et al., 1992)	Points, badges, leaderboards, cooperation, and competition	<p>The class attendance was higher in the experimental group (gamification) than in the control group. Leaderboards were motivating for most participants, but some students that were less competitive did not feel motivated.</p> <p>Student's intrinsic motivation was negatively affected by gamification. In general, this study suggested that intrinsic motivation decreased over time in a gamified learning experience, only the most extrinsic motivation (controlled motivation) remained stable over time.</p>
19	Santhanam et al. (2015)	182	Higher (Technology Mediated Training)	Cross-sectional	Self-Efficacy and Learning Outcomes (Santhanam et al., 2009)	Competition and levels	<p>Student's self-efficacy beliefs, learning outcomes, engagement and enjoyment in the gamified activity were high when they faced other students with the same level or lower level of comprehension/skills. In opposition, less competitive students, and students in competition against other students with higher abilities were less motivated.</p>
20	Stansbury and Earnest (2016)	93	Higher (Organizational Psychology)	Longitudinal with control group	Perceived experience (Stansbury & Earnest, 2016)	Points, roleplay, storytelling, competition and cooperation	<p>Students in the gamified group did not perform academically better than students in the control group (traditional learning); however, students did engage and were more motivated and satisfied in the gamification condition.</p> <p>Individual preferences had an impact in gamification, some students were more motivated in competition.</p>
21	Su (2015)	107	Higher (Software Engineering Education)	Longitudinal	Gamification Software Engineering Education Learning System (GSEELS; Su, 2015)	Points, roleplay, storytelling, and instant feedback	<p>High degrees of gamification (deep gamification) improved student's motivation; however, gamification can increase student's cognitive load.</p>

Nr.	Authors (Year)	Sample size	Education Level	Type of Study	Motivation Instruments	Gameful design	Gamification effects on Motivation
22	Tan (2018)	22	Higher (English Language Communication)	Cross-sectional	Intrinsic Motivation Inventory (Ryan, 1982)	Avatar, instant feedback and storytelling	After one week of exposure to gamification, student's intrinsic motivation results were higher than average in enjoyment/interest and perceived choice (autonomy).
23	Zainuddin (2018)	56	High (Science class)	Longitudinal with control group	Students' perceived levels of competence, autonomy, and relatedness in a gamified flipped class (Zainuddin, 2018)	Badges, points, leaderboards and competition	Student's intrinsic motivation was higher in the experimental group (gamified) than in the control group. Competence, autonomy, and relatedness were fulfilled in the gamified experience, this led them to higher levels of intrinsic motivation and of participation in gamified activities; therefore, students were motivated to unlock badges, gain points and to compete against each other.

## Discussion

The present study aimed to explore a set of studies focused on gamification effects on student's motivation and the psychometric instruments used to measure motivation, to highlight what is (and how it is) the most effective. Most studies identified in this systematic review center their analysis in the influence of gamification on the basic psychological needs. In fact, Self-Determination Theory was the most popular motivational theory explored in this review and the Intrinsic Motivation Inventory (IMI; Ryan et al., 1991) the most used instrument. The influence of gamification in student's motivation was analyzed more in a qualitative level than a quantitative one, focusing on basic psychological needs and type of motivation roles. The dichotomy extrinsic motivation and intrinsic motivation and the comparison of student's motivation between gamification and other learning strategies (e.g., traditional methods, flipped learning) are the most explored in gamification studies. Most studies that used IMI reported high levels of enjoyment and autonomy when students were using gamification. This can be evidence that gamification can lead students to a gameful experience, since some features as enjoyment, engagement and motivation are basic state benefits included on a gameful experience.

But there are some concerns regarding gamification, since most of the rewards are boosters of extrinsic motivation, leading students to be more external motivated and orientated [9;13;18;19]. Also, gamification can foster competition and for some students this strategy can increase student's anxiety levels due to social comparison, usually, imposed by rankings and achievements, giving advantage to more competitive students [19]. Competition seems, indeed, to be an influential variable in student's motivation decrease, where some students lose interest in gamification if they fail [9; 18]. If a student

finds himself in a lower place in a leaderboard or can't unlock most badges as a fellow student can, anxiety and motivational levels can decrease [7]. Also, when it comes to competition, some students can be less motivated if they are competing against other students [19]. Competition is one of the reasons of failure in gamified learning systems and, consequently, social comparison should be avoided [6].

Besides the negative feelings associated with extrinsic rewards and social comparisons, gamification can be successful in promoting motivation, especially under specific conditions. Gamification techniques must have a complex design and be challenging so that students can use those complex applications, achieving therefore gameful states; but for that to happen, gamification designs must be appealing [22].

Another issue with gamification is the novelty effect of gamification. It seems that student's motivation decreases when they are exposed to gamified learning strategies for a long time [9]. In short-term experiences with gamified learning, the results point to high levels of student's motivation and satisfaction [2;5;6;16;19]. The reduction of motivation happens especially after a long exposure to a gamified design, when the novelty effect disappears, and students lose interest in the gamification process [7;9;13;18]. There is, however, evidence that complex gamified designs can reduce the influence of the novelty effect, leading students to higher levels of motivation even on a longer exposure to gamification [10;12;20;22]. In this review, the studies with the most complex gamification strategies [10; 12; 16; 20; 21; 22] revealed an increase of student's motivation despite being longitudinal studies. This may be due to advanced gamified designs can have specific conditions (e.g., alternate strategies, groups and tasks) easily leading to gameful experiences, which can contribute to more motivation and engagement towards academic tasks.

## **Conclusion**

In an era of advanced technology, students still can have low interest levels in (and for) their classrooms and tasks. Gamification can constitute as a powerful tool, combining videogames, technology, and academic contents so that student's enjoyment and motivation can increase (Zainuddin et al., 2020). Although gamified learning is still in its early days, gamification designers are trying to achieve a sense of autonomy, competence and relatedness in gamified apps to promote intrinsic motivation.

In a systematic review conducted in 2020, the authors concluded that gamification was beneficial for student's motivation and engagement in a short-term period of intervention as a relevant strategy (Zainuddin et al., 2020). Sailer and Homner (2020) meta-analysis revealed a significant effect of gamification on motivation to learn. These results are in line with this systematic review, showing, that, in general, gamification leads to student's motivation to learn, even if in a performance and external orientation.

Gamification is a strategy that foster extrinsic motivation and competition. Most game elements, as points and rankings, are competition-oriented and other game elements, as badges, promote external rewards. This can influence student's motivation in a long-term exposure. Also, competition can decrease student's confidence and competence, mining one of the basic psychological needs and self-efficacy beliefs, diminishing its strategical potential (Hanus & Fox, 2015; Santhanam et al., 2015). Although these findings can cause some concerns, extrinsic motivation can be positive for some students (Ryan & Deci, 2000): if a student is not engaged or find purpose in some tasks or subjects, gamification can boost his/her actions (e.g., Reeve, 2009). External rewards do not work for every student and can lower already motivated students' performance and motivation.

In sum, gamification is a strategy that tries to engage and motivate students in the same way that games do. There are lots of game elements and characteristics that can be used to engage students in learning. However, gamification can demotivate some students due to extrinsic rewards. Also, students react better to gamification when the process is new; in longer exposures gamification can become less influential and even boring. For this reason, gamification should be carefully introduced in education.

## **Future research**

In this systematic review, we only explored high school and higher education students. However, it is also important that future systematic reviews include more younger students.

Also, in gamification research we noticed that there is still not a consensus about gamification since this learning strategy is often mistaken with serious games and game-based concepts. Future studies should explore the differences between these approaches and compare their motivational potential.

Future research on the effects of gamified learning design should also explore the novelty effect. This gamification phenomenon has been identified as an important factor and a negative influence of gamification in student's motivation. Researchers also must explore the contribution of the complexity of gamified design to student's motivation in a longer gamification exposure and the influence of student's traits in the gamification success.

## **Limitations**

This systematic review uses a small sample, we could explore grey literature to find more articles. Also, we only analyzed articles published in English, which can limit some findings.

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## **Capítulo III – Considerações finais**

## **Considerações finais**

A gamificação é um conceito recente e, como tal, o seu estudo ainda tem um longo caminho a percorrer. Tem sido associada ao aumento/promoção da motivação e do envolvimento dos utilizadores, devido à utilização de elementos provenientes de jogos. No sentido de verificarmos os efeitos da gamificação educativa na motivação dos alunos, recorreremos a uma revisão sistemática.

Os resultados da revisão sistemática revelaram efeitos positivos da gamificação e são congruentes com os resultados apresentados por outras revisões sistemáticas (Sailer & Homner, 2019; Zainuddin et al., 2020). No entanto, a utilização de estratégias de gamificação pode ser prejudicial e ter efeitos de retrocesso motivacional. O estudo de Hanus e Fox (2015) analisou o impacto da gamificação na motivação por um longo período de tempo e concluiu que a exposição à gamificação teve um efeito negativo na motivação dos alunos e nos resultados escolares, uma vez que a motivação intrínseca reduziu perante a motivação extrínseca.

Para além disso, a gamificação é baseada na recompensa e na competição, fatores esses que podem explicar a redução da motivação intrínseca a longo-prazo e o conseqüente aumento da ansiedade. Contudo, a motivação extrínseca pode ser importante para os alunos. Alguns estudantes simplesmente não conseguem encontrar motivação para aprender algumas matérias. É, exatamente, nestes casos que a motivação extrínseca pode ter o seu contributo, os alunos que não estão motivados para aprender podem necessitar de uma certa “muleta” (Reeve, 2014). Ora, esse apoio pode vir da motivação extrínseca através de incentivos/recompensas.

Nesta revisão sistemática, alguns estudos realçaram a importância da motivação extrínseca para um melhor desempenho dos alunos (Stansbury & Earnest, 2016; Roy & Zaman, 2018). De facto, é nestes aspetos que a gamificação pode ser importante, uma vez

que nem todos os alunos aprendem pelo prazer de aprender. Para alguns alunos, fatores como o estatuto ou as recompensas que advêm do mérito acadêmico são mais apelativos e podem ser impulsionadores de bons resultados acadêmicos.

Outro aspecto a se ter em conta é a heterogeneidade dos alunos, alguns são mais competitivos do que outros. Essa diferença de características individuais faz com que a gamificação tenha efeitos diferentes nos alunos. Alguns alunos são mais orientados para a socialização outros para o desempenho (Zainuddin et al., 2020). Estes fatores contribuem para reações diferentes às estratégias gamificadas. A competição, por exemplo, tem efeitos diferentes nos alunos, enquanto alguns aumentam o desempenho, outros reduzem, um dos fatores que mais contribui para isso é a autoeficácia. Alunos com maior confiança nas suas capacidades têm uma maior propensão para a competição. Por outro lado, os alunos com expectativas de autoeficácia inferiores preferem evitar a competição, sendo, frequentemente, afetados por emoções negativas como a ansiedade e a frustração (Hanus & Fox, 2015; Santhanam, 2016).

Esta revisão sistemática pode ser benéfica para os futuros estudos dos efeitos da gamificação na motivação dos alunos e para uma integração eficaz destas práticas no sistema educativo. Pode concluir-se que as estratégias gamificadas complexas podem aumentar a motivação e o desempenho escolar dos alunos. Isso deve-se às características lúdicas da gamificação. Os alunos podem atingir bons níveis de envolvimento e de diversão com as aplicações gamificadas, se for proporcionada uma experiência de jogo (Hogberg et al., 2019; Huotari & Hamari, 2017). Devido a essa componente, alguns estudos revelam aumentos da motivação intrínseca dos alunos (Hazan et al, 2018; Jurgelaitis et al., 2018; Pinter et al., 2020; Tan, 2018; Zainuddin, 2018). Contudo, efeitos negativos da motivação nos estudantes também foram reportados (Hanus & Fox, 2015; Roy & Zaman, 2018; Kyewski and Krämer; 2018; Facey-Shaw, et al., 2020). Os

decréscimos de motivação foram associados a fatores como o efeito de novidade (perda de interesse ao longo do tempo), a competição e a comparação social. Estes resultados demonstram que a gamificação pode ser um recurso explorado no processo de aprendizagem. Contudo, para além de serem necessárias estratégias gamificadas apelativas e divertidas, os professores devem estar atentos aos efeitos que a gamificação provoca nos alunos, uma vez que nem todos reagem positivamente às características das estratégias de gamificação. Alguns elementos dos jogos, como por exemplo, as tabelas classificativas ou os distintivos podem provocar sentimentos negativos nos alunos e consequente decréscimo de motivação e desempenho escolar.

Em suma, a gamificação pode ser utilizada como recurso para motivar os alunos, deve, no entanto, ser utilizada com cuidado, sendo que nem todos os alunos irão se revelar mais motivados (ou seja, mais autónomos e internamente orientados) perante as tarefas académicas. Atendendo às características individuais dos alunos e das turmas no seu todo, os recursos gamificados podem revelar-se promotores de motivação para os alunos, principalmente em determinadas condições. Contudo, é preferível que a comparação social seja evitada, para que a ansiedade social não possa interferir com os benefícios da gamificação, cuja principal finalidade se prende com promover uma sensação de jogo, para que, como isso, os alunos possam estar envolvidos nas matérias académicas.

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