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Gamification in higher education. A systematic literature review

Gamification nell'istruzione superiore. Una revisione sistematica della letteratura

Federica Pelizzari

Università Cattolica del Sacro Cuore, Milano, Italy, federica.pelizzari@unicatt.it

ABSTRACT This article explores the transformative role of gamification in higher education through a systematic literature review. Rooted in the concept of gamefulness, gamification involves the intentional integration of game elements to enhance student engagement and learning experiences. The systematic literature review focuses on gamification in higher education, using the PRISMA model to conduct the analysis. The search protocol employs a rigorous search strategy using five online databases, excluding non-English language articles and duplicates. Adopting an aggregative review approach, the study delves into the theoretical framework of gamification, tracing its definitions, underlying principles and potential impacts on learning outcomes. The narrative textual synthesis of the 53 selected articles reveals a diverse landscape of gamification implementations in higher education, highlighting challenges in the uniformity of theoretical and empirical analyses. Then a thematic analysis is also proposed exploiting the results of a "meta-summary", to explore the relationships among themes. The conclusions emphasise the need for a functional, working model of gamification implementation to effectively address teaching improvement goals.

KEYWORDS Gamification; Higher Education; Systematic Literature Review; Engagement and Motivation; Active Learning.

SOMMARIO L'articolo esplora il ruolo trasformativo della gamification nell'istruzione superiore attraverso una revisione sistematica della letteratura. Radicata nel concetto di gamefulness, la gamification comporta l'integrazione intenzionale di elementi di gioco per migliorare il coinvolgimento degli studenti e le esperienze di apprendimento. La revisione sistematica della letteratura si concentra sulla gamification nell'istruzione superiore, utilizzando il modello PRISMA per condurre l'analisi. Il protocollo di ricerca impiega una strategia di ricerca rigorosa utilizzando cinque database online, escludendo gli articoli non in lingua inglese e i duplicati. Lo studio, che adotta un approccio di revisione aggregativa, approfondisce il quadro teorico della gamification, tracciandone le definizioni, i principi di base e i potenziali impatti sui risultati dell'apprendimento. La sintesi narrativa testuale dei 53 articoli selezionati rivela un panorama variegato di implementazioni della gamification nell'istruzione superiore, evidenziando le sfide nell'uniformità delle analisi teoriche ed empiriche. Successivamente, viene presentata un'analisi tematica che si avvale dei risultati di un "meta-sommario" al fine di esplorare le relazioni tra i diversi temi. Le conclusioni sottolineano la necessità di un modello funzionale e funzionante di implementazione della gamification per affrontare efficacemente gli obiettivi di miglioramento dell'insegnamento.

PAROLE CHIAVE Gamification; Istruzione Superiore; Coinvolgimento e Motivazione; Apprendimento Attivo.

1. Introduction

Gamification, a concept born from the convergence of game design elements and non-game contexts, has emerged as a transformative force in various domains, including the realm of higher educa-

tion. This study aims to provide a nuanced exploration of gamification in higher education, delving into its definitions, underlying principles, and potential impacts on learning outcomes.

The British game programmer Nick Pelling introduced the term 'gamification' in 2002, which gained widespread attention in 2010 following Jesse Schell's discourse at the DICE conference. Thereafter, Deterding et al. (2011) defined gamification as the use of game design elements within contexts unusual to gaming. In the context of higher education, this involves the intentional infusion of game elements into educational practices, creating an environment that fosters engagement, motivation, and interactive learning experiences (Goethe, 2019; Kaliban et al., 2023).

At its core, gamification engages with the practical experience and behavioural qualities of play, referred to as 'gamefulness'. Deterding's framework further delineates the aspects of "gameful interaction" (objects enabling play quality) and "gameful design" (the deliberate design of gamefulness).

When using gamification in higher education contexts, this should be done by integrating game design elements not as mere embellishments, but as strategic components aimed at enhancing student engagement and overall learning experiences (Riar et al., 2022).

Importantly, Kapp's definition (2012) positions gamification as a comprehensive strategy involving game-based mechanics, aesthetics, and playful thinking. Within the educational context, this multifaceted approach encompasses game-based objectives, mechanics such as levels, points, and badges, aesthetics, game thinking, participant involvement, motivation, learning promotion, and problem solving (Burke, 2016).

Thus, the integration of these elements goes beyond superficial enhancements, establishing an immersive and adaptive educational environment (Sercemeli & Baydas Onlu, 2023). Indeed, the characteristics outlined by Kapp underscore gamification's potential as a holistic educational strategy, rather than a standalone technological overlay. A well-designed gamified system provides an alternative rendering or approximation of reality, offering hypothetical, imaginary, or fictitious experiences that resonate with learners (Landers et al., 2015). Moreover, the gamified structure, when aligned with broader educational objectives, enhances the presentation and delivery of core educational content (Kam & Umar, 2022).

An essential contribution of gamification to higher education is the reduction of the fear of failure: in a gamified learning environment, students are encouraged to explore, take risks, and learn from consequences, mirroring the adaptive nature of games (Toda et al., 2019). In fact, Kapp's emphasis on the addictive elements of gamification, such as a sense of accomplishment, cooperation learning, immediate feedback, and the reduction of the burn of failure, highlights the motivational aspects of gamification crucial for sustained engagement.

Vesa's perspective (2021) adds depth to this framework by highlighting that gamified systems should be intrinsically driven by non-game objectives. Importantly, successful gamification in higher education must align with broader educational goals and objectives (Jagoda, 2020). In particular, the gamified structure should not overshadow, but rather enhance the core educational content, ensuring that it remains central to the learning experience (Richter et al., 2015).

In ensuring the implementation of effective gamification in higher education, a player-centred approach is of paramount importance (Nicholson, 2015). Understanding the goals and motivations of students should allow educators to tailor gamified solutions that resonate with the learner demographic (Hallifax et al., 2019; Perez-Aranda et al., 2023).

Thus, Boller and Kapp's (2017) suggest an empirical approach encouraging designers to explore, collect data, and recognise patterns in learner behaviour, ultimately ensuring that the gamified elements align seamlessly with educational objectives.

In this contribution, we propose a systematic literature review, which further explores the adoption of gamification in higher education contexts, in an attempt to further understand the state of the art in this sector.

2. Design and analysis of the systematic literature review

The notion of gamification in education has been explored in several Systematic Literature Reviews (SLRs) (Morandi & Camargo, 2015; Hamari et al., 2014; Caponetto et al., 2014; Rodrigues et al., 2020; Manzano-León et al., 2021). In these studies, the topic is addressed rather broadly and not specifically in the context of higher education, by critically assessing gamification's theoretical foundations, methodological approaches, models, platforms, apps, mechanics, and learning outcomes. Some other studies explore e-learning and online training interventions (Antonaci et al., 2019; Saleem et al., 2022), while others focus on sporting activities (Koivisto & Hamari, 2019), medical prevention (Johnson et al., 2016; Muangsrinoon & Boonbrahm, 2019), business management (Ferreira et al., 2017; Silva et al., 2019), and tourism (Pasca et al., 2021). In this study, we narrow the scope to the specific context of higher education, as it is further explained in the following section.

2.1. Research questions

As already mentioned, in our study, we decided to focus on gamification in higher education. Although in the recent literature, you can find other similar literature reviews (Subhash & Cudney, 2018; Castillo-Parra et al., 2022; Khaldi et al., 2023), we decided to devote ourselves to a detailed analysis focusing on the various phases involved in the didactic design of gamification (Mora et al., 2015), examining the stages from the initial conception of the objectives to the subsequent implementation phase. While there exist comparable literature reviews in recent scholarly works (Subhash & Cudney, 2018; Castillo-Parra et al., 2022; Khaldi et al., 2023), our distinct contribution lies in our deliberate choice to immerse ourselves in a comprehensive exploration of the intricacies within the didactic design of gamification. Instead of providing a broad overview, we have undertaken a specialized analysis that meticulously dissects the diverse phases integral to the didactic design process. Our focus spans from the inception of educational objectives, where the groundwork is laid, to the subsequent and equally pivotal phase of implementation. By narrowing our scope to these specific stages, we aim to offer a nuanced understanding of how gamification can be strategically conceptualized and seamlessly integrated into educational practices (Majuri, Koivisto & Hamari, 2018), providing unique insights that extend beyond the purview of existing literature reviews. Therefore, we addressed three research questions:
- RQ1. Has gamification been implemented in higher education since 2011? How is the term 'gamification' geographically distributed within the scientific literature?
- RQ2. What theoretical vision do the relevant studies foreground? What is the focus of the studies (in terms of research questions and hypotheses)? What are the modes and duration of implementation?
- RQ3. What are the factors influenced by gamification in the retrieved studies? What are the elements of gamification adopted? What are the learning outcomes addressed?

Based on the above questions, we adopted the PICO framework (Uman, 2011; Kitchenham, 2012), which helped to delineate the parameters of our study. Hence, the Population (P) includes higher education students and teachers. The chosen Intervention (I) for this SLR is gamification. The Control/

Comparison (C) involves the elements intrinsic to gamification implementation, theoretical models, and anticipated learning outcomes. Finally, the Outcomes (O) encompass the varying positive impacts of gamification on the population and the emerging best practices in gamification design, management, and evaluation. As required by the protocol, the SLR contains only primary studies.

2.2. Review type

The review type we choose for this research is an 'aggregative review', specifically a realist review (Popay et al., 2006), i.e. an interpretive technique that integrates qualitative and quantitative research evidence within specific contexts (Saini & Shlonsky, 2012). In line with aggregative reviews, this study allows a precise and in-depth analysis and synthesis, focusing on specific elements and detecting outlined gamification models.

The synthesis approach we chose is the Textual Narrative Synthesis (Littell et al., 2008), an aggregative approach that organises studies into more homogeneous groups. This synthesis method involves comparing study characteristics, context, quality and results, highlighting both similarities and differences (Henderson et al., 2010).

Another analysis method used was the "meta-summary", i.e. a method that aims to integrate results retrieved from thematic summaries or data investigations (Sandelowski et al., 2007). For this purpose, it is necessary to extract, group, abstract and format the results, but also calculate the frequency and intensity of the effects (Ghirotto, 2020). The meta-summary aims at investigating the retrieved qualitative studies, to understand what their focus is and what topics they address. The strategy for creating the meta-summary involved a thematic analysis of the retrieved articles, the assignment by the coders of themes and sub-themes to each article and the following creation of a conceptual map of the relationship between the themes. Finally, starting from these themes, the calculation of their frequency in the sample and their intensity was carried out.

2.3. Research protocol and PRISMA system

We decided to use five online citation databases through which to search the existing literature (see Table 1).

Table 1. Databases used in this SLR.

Databases	Web sites
Google Scholar	https://scholar.google.com
JSTOR	https://www.jstor.org/
ERIC	https://eric.ed.gov/
Web of Science (WoS)	https://www.webofscience.com/wos/woscc/basicsearch
Scopus	https://www.scopus.com/

Notably, in this study we deliberately decided to avoid exploring social databases, such as Academia and ResearchGate, in order to prioritise primary, peer-reviewed work and exclude grey literature, guided by the reflection table proposed by Garousi et al. (2018). Only articles written in the English

language between 2011 (the inception of the term 'gamification') to June 2023 were considered, and the search focused solely on open-access articles in the specified databases. Our article collection was managed with the Mendeley programme[1], a free reference manager supporting the storage, organisation, annotation, and sharing of references and research data. A list of keywords for the search string across all databases was defined based on the previously mentioned PICO framework.

The search string, using Boolean operators (Scells et al., 2020) was the following:

Gamif* AND (online OR blended OR hybrid) AND (higher education OR university OR academic OR college) AND (teacher* OR student*)

We decided to use asterisks (*) to include in our search all the lemmas derived from and possibly related to the subject of the investigation (e.g. gamif* to cover terms such as gamified, gamify, and gamification). The search was performed on titles, keywords and abstracts. Moreover, to manage the potentially vast pool of irrelevant studies resulting from a full-text search in the databases, non-English articles and duplicates were excluded from the considered body of literature.

The search string's accuracy was ensured by manually verifying its effectiveness through the identification of relevant publications. This validation process involved confirming that the search returned these publications in one of the selected bibliographic sources. Following the definition of the search string and source, eligibility criteria (for both inclusion and exclusion) were established to guide the selection of primary studies for this study's review. Additionally, inclusion criteria were predetermined to set the minimum conditions justifying a study's admission into the review. In contrast, exclusion criteria were determined later during the eligibility process.

The resulting final list of the inclusion and exclusion criteria is provided in Table 2.

Table 2. Criteria for inclusion and exclusion of this study's SLR.

Inclusion criteria	Exclusion criteria
Peer review	MOOC (Massive Open Online Courses)
Language: English	Exclusive use of Audience Engagement Tools (Kahoot!, Quizizz, Mentimeter, Socrative, WooClap, etc.)
Explicit gamification elements	Experimentation of less than 3 hours/1 lesson
Implementation in Higher Education (empirical papers)	Implementation in primary and/or secondary schools and in settings such as marketing, health, business, fashion, etc.
Between 2011 and 2023	Use of Virtual Reality (VR) and Augmented Reality (AR)
Use of experimentation monitoring/evaluation tools (both qualitative and quantitative)	Use of Game Based Learning and Escape Rooms

The exclusion criteria were chosen for specific reasons:
- MOOCs (Massive Open Online Courses): Due to significant differences in design, delivery, and beneficiaries compared to traditional higher education courses, MOOCs are excluded.
- Exclusive use of AET (Audience Engagement Tools): Sole reliance on AET does not constitute gamification, but only a potential short-term engagement, leading to exclusion.

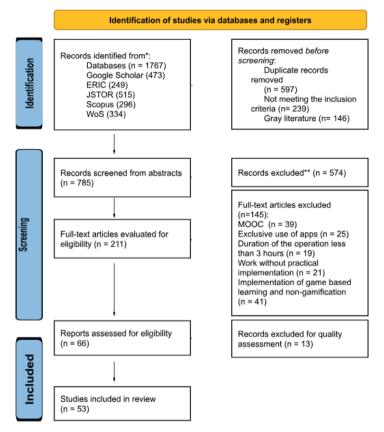[1] On the Internet: URL https://www.mendeley.com/search/

Figure 1. PRISMA diagram.

- Implementation outside higher education: This choice aligns with the SLR's scope i.e. focusing on higher education.
- Use of AR (Augmented Reality) and VR (Virtual Reality): Due to their complexity and resource-intensive nature, studies involving AR and VR are excluded based on practical and economic considerations.
- Game Based Learning and Escape Room: Their exclusion is based on the common conflation of gamification with these models, ensuring the selection of studies implementing gamification as defined by this review.

Moreover, the 2020 version of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Flow Chart was used to configure the search (see Figure 1). No automation systems were used, but the researchers did the selection manually.

The diagram illustrates the path of information through the various stages of a systematic review, plotting the number of records identified, included and excluded, together with the reasons for the exclusions. Indeed, the initial paper count is substantial, with a notable presence of duplicates across various databases. The above diagram also illustrates the considerable exclusion of works during the initial screening phase. The misuse of the term 'gamification' in the literature and frequent instances of applications outside higher education contributed to the significant reduction in the identified works.

2.4. Biases mitigation

Before commencing the research, we made efforts to minimise biases[2] in order to avoid their potential impact on research reliability (Higgins et al., 2011). Specifically, our SLR addressed five types of biases: publication bias, time interval bias, location bias, language bias, and selection bias (Gough, Thomas, & Oliver, 2019).

Publication bias, the most significant among others, was mitigated by employing a complex search string and Boolean operators. Time interval bias was minimised by including studies from 2011 to 2023, aligning with the first definition of gamification by Deterding (2011). Location bias was curtailed by utilising results from five diverse databases, including two that are specialized in education (ERIC and JSTOR).

Notably, while linguistic bias remains unresolved, we acknowledge this and note it as a limitation in this SLR. We also considered selection bias, taking into account the high number of papers identified in the initial phase (1767). Noting these considerations and the established protocol, we subsequently proceeded with our review and analysis.

3. Results

Below we present the obtained data that can be used to answer our research questions. Included within the final References list there are the 53 selected post-SLR articles (marked with an initial asterisk), excluding the 14 articles that did not pass the quality assessment stage (Carroll & Booth, 2015).

3.1. Geographical and time distribution of studies (RQ1)

Figure 2 shows the geographical distribution of the retrieved studies. The data reveal the majority of articles relevant to our study originate from the United States of America (USA), followed by Turkey, Spain, and Hong Kong.

Publications on higher education began in 2013, with the highest volume being witnessed in that year. From 2014 to 2016 and between 2021 and 2023, the average percentage of publications on higher education is 7% (N = 4). Surprisingly, the majority of selected studies were found to have been conducted between 2010 and 2018, in contrast with our expectation of finding more studies during or post the COVID-19 time.

3.2. Founding theories (RQ2)

The founding theories cited in the articles considered in this SLR are very diverse and complement each other. As we can see in Figure 3, the most cited founding theory turns out to be Deci and Ryan's self-determination theory (SDT) (2012), with a presence of 38.46% (N = 20). The other theories are instead presented and cited in a very different and scattered manner: among these, Bartle's (1996) classification of player types is notable (5.77% presence, N = 3), tied with flipped classroom (Ozdamli & Asiksoy, 2016), goal setting (Latham & Arshoff, 2013), and social comparison theory (Festinger, 1957). Again with a presence of 5.77% (N=3), game-based learning emerges as a relevant theory: hav-

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[2] Biases in this area are defined as variations and/or deviations in the literature review that alter and distort the analysis and synthesis of studies, thus leading to the final overview not being reliable and replicable.
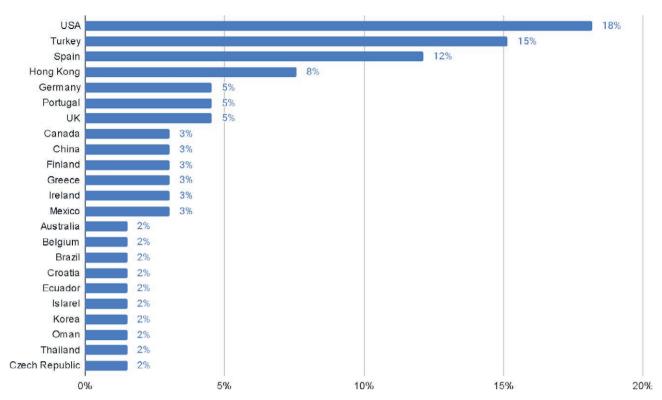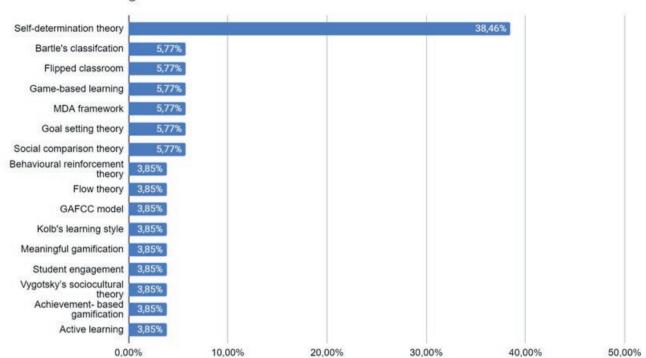
Figure 2. Origin of studies.

ing eliminated at an early stage the articles that confuse gamification with game-based learning, in the selected articles we found that gamification is mentioned from the point of view of the use of game elements revised and implemented in a gamified didactic model; this is why they were included in our SLR. Finally, it is necessary to dwell on the MDA (Mechanics, Dynamics, and Aesthetics) framework (Hunicke et al., 2004): it is directly included as the basic framework of gamification itself, while we found some authors choose to favour this framework as one of the theories on which gamification is based. With smaller percentages of presence (3.85%, N = 2) emerge the flow theory (Csikszentmihalyi et al., 2018), the GAFCC model (Goals, Affordances, Feedback, and Constraints Model) (Huang & Hew, 2018), Kolb's learning styles (1984), Nicholson's meaningful gamification (2015), student engagement, and the value of active learning.

A reflection can be made on the latter theories mentioned above: not all authors claim that the flow theory is attainable and/or verifiable with gamification – especially when it is protracted over a long period of time (Oliveira et al., 2022) – just as not all studies claim to be able to contribute to students' learning styles, since gamification is an educational approach and - as such – it attempts to adapt to all possible learning styles (Buckley & Doyle, 2017). Additional insights gleaned from our study prompt contemplation on two noteworthy aspects: meaningful gamification and the GAFCC model. While not constituting foundational theories in the conventional sense, these frameworks offer more detailed specifications and in-depth examinations of gamification. Specifically, meaningful gamification and the GAFCC model approach gamification from a didactic and educational learning perspective, surpassing mere theoretical foundations. Rather than being abstract concepts, these frameworks serve as comprehensive theories that furnish researchers with valuable guidelines and reflections. They delve
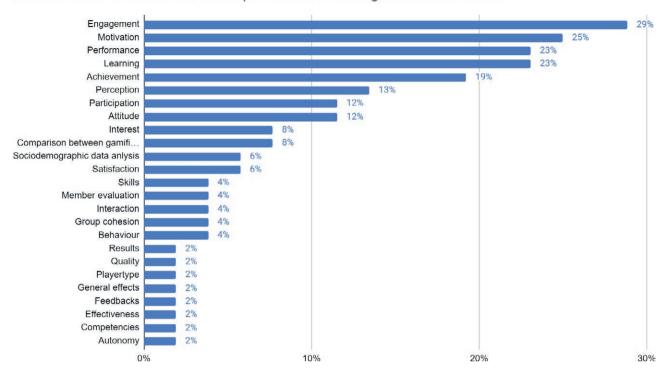
Figure 3. Founding theories.

into the intricacies of gamification's impact and functionality within the context of learning, providing a rich framework for understanding how gamification can be meaningfully employed to enhance educational experiences. On the other hand, with regard to student engagement and the value of active learning, considering the importance that the authors of its definition attribute to it in their articles, one would expect to find more studies in which these theories are cited and reported.

3.3. Research questions and hypotheses (RQ2)

Although the research hypotheses of the articles considered by our SLR are very different from each other, we are able to trace them back to a few macro-areas.

Almost one third (29%, N = 15) of the research questions referred to in the analysed articles focus on student engagement. The authors investigate whether the introduction of gamification or of two different modes of gamification increase student engagement. Other studies address research questions investigating whether student motivation increases through gamification. These studies are the 25% (N = 13) of the total number of retrieved papers. Another 23% of the studies (N = 12) investigate whether learning improve and whether, at the same time, performance in the pre- and post-tests or in the comparison with the control group is higher. 19% (N = 10) of the studies has to do with the achievement of the students' learning outcomes. Another significant proportion of the studies considered (13%, N = 7) investigate what the students' opinions of gamification are, either before/after attending a given course or only afterwards. In the next position, by a difference of just one percentage point, there are studies concerning, among others, participation: do students who take part in a

Tematiche delle domande o delle ipotesi di ricerca degli studi selezionati

Figure 4. Research questions and hypotheses.

course in which gamification is included and participate more than students who take part in a traditional course?

Also in 12% (N = 6) of the cases, the researchers investigate what approach, behaviour, or position the students take towards gamification, and explore if and how this changes before and after the experimentation. 8% (N = 4) of the studies seek to understand whether the use of different types of gamification leads to the same outcome or whether, on the contrary, some are more suitable than others, depending on the intended purpose, in light of stimulating students differently or proving more suitable for certain types of courses or disciplines. A further 8% (N = 4) of the studies investigate whether the use of gamification leads to an increase in students' interest in the course they are following. In 6% (N = 3) of the bibliography considered, the following two aspects are investigated: satisfaction and the relationship between gamification and socio-demographic traits. Interestingly, some studies investigate whether gamification increases the satisfaction of the students taking the course, comparing the results between, before, and after the course or comparing the course group in which gamification is implemented to the control group. Other studies investigate whether the sociodemographic traits (age, gender, etc.) of the subjects exposed to gamification influence the result. Others investigate whether and how gamification increases students' abilities, while some hypothesize that implementing gamification during group work may yield beneficial outcomes. Moreover, there are articles and studies that question whether and how interactions between students (whether alone or in groups) change: some hypothesise that the cohesion of a group is stronger when working through gamification, while others investigate whether the behaviour of students participating in a gamified course improve or not.

This overview allows three reflections. The first concerns the actual usefulness of the implementation of gamification, especially enabling us to think about its possible impact on participation and motivation: since students are more stimulated, they participate more purposefully and are more motivated in higher education courses. The second reflection relates to satisfaction. This cannot only be analysed globally; however, the different gamification elements implemented must be thoroughly analysed. The third relates to those questions, which are not apparently adequately addressed in the scientific literature, i.e. 'if' and 'how' gamification improves students' skills. On this aspect, the only noteworthy study we found is the one conducted by Riar et al. (2022) on cooperative work and gamification; however, this is not entirely experimental.

3.4. Modes of implementation and duration (RQ2)

In total, 89% (N = 46) of the studies included in our SLR are implemented in university contexts and only 11% (N = 6) are used in post-graduate corporate training but managed by universities. Considering this data, we tried to analyse the learning modalities proposed by these studies: 58.5% (N = 31) of the studies apply gamification within face-to-face courses, while only 24.5% (N = 13) do the same in a blended mode. Finally, only 17% (N = 9) of the studies apply gamification within courses delivered entirely in an e-learning format. This is surprising because companies often conceive gamification precisely as an element to be implemented in self-training courses, thus using this approach to sustain the pace of training and spur people on towards completing their course. Instead, we found that the blended format is quite common, despite the scarcity and mainly empirical nature of studies linking blended learning and gamification (Tan & Hew, 2016). Certainly, blended approaches, with their presence-synchronous-asynchronous alternation, could in principle fit well with the gamification approach, allow students to value, and pay attention to all three learning phases, as well as to respect their specific cadence.

In line with our exclusion criterion, we eliminated all implementations lasting for only one lesson and/or less than three hours. Our subsequent analysis shows a varied picture: 53.1% (N = 26) of the studies manage to implement gamification for one semester, but only 12.2% (N = 6) manage to sustain its implementation over the entire academic year. Moreover, 12.2% (N = 6) of the studies implement gamification within a range of one to four weeks, while 8.2% (N = 4) studies implement it for five to eight weeks, and 6.1% (N = 3) studies implement it over nine to ten weeks. Finally, 6.1% (N = 3) of the studies produce a course that applies gamification for two consecutive years, while 2% (N = 1) concern longitudinal work over three years.

The overall picture makes us think first about the sustainability of gamification: being an approach that requires planning and design, implementing it for a long time is not always easy and sustainable.

3.5. Impacted factors (RQ3)

As per Figure 6, the factors mentioned in the retrieved studies as impacted by gamification, are many and varied: at first position, with 50% (N = 26), are performance and learning, while perception and satisfaction with gamification (48.08%, N = 25) are in second position, followed by motivation and engagement (36.54%, N = 19) and points, scores, and grades (36.54%, N = 19). Next come social and personality traits (26.92%, N = 14), along with attendance and participation (29.62%, N = 14), and then knowledge and skills (21.15%, N = 11), and scholastic aptitude (11.54%, N = 6). Of particular impor-
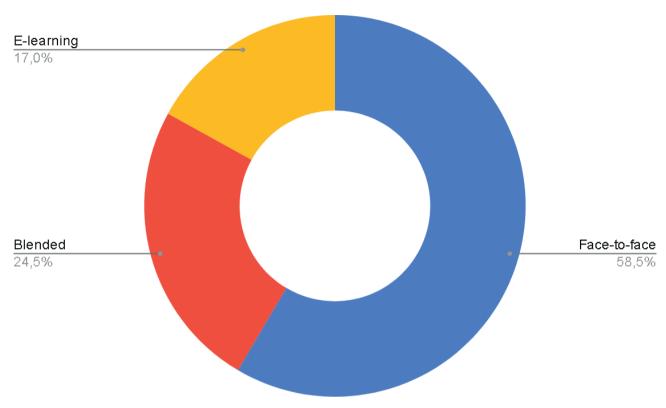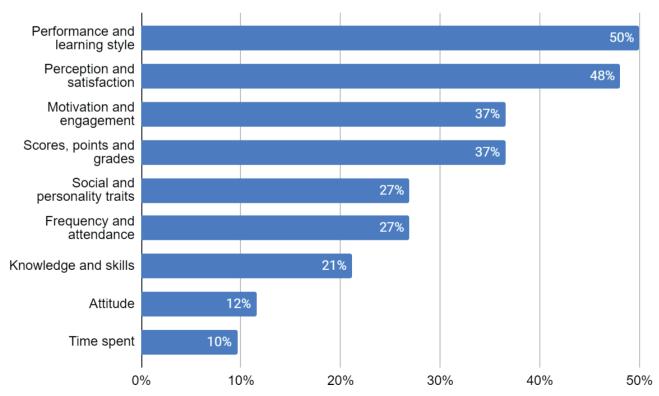
Figure 5. Implementation modes.
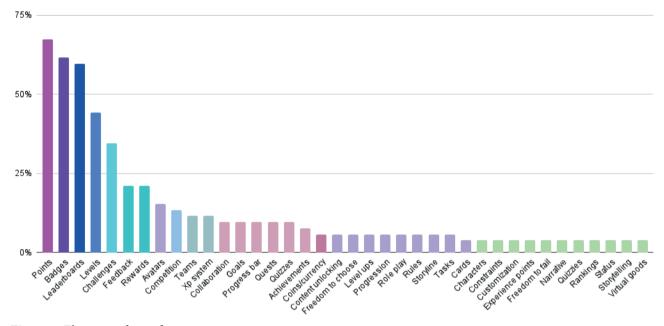

Figure 6. Impacted factors.

Figure 7. Elements of gamification.

tance is our finding regarding the impacts on social abilities (e.g. collaborative competence, ability to teamwork, and leadership) and on the knowledge and skills that gamification can achieve. Further, there are some studies that tried to investigate gender and age differences with regard to the impact of gamification, albeit without obtaining unequivocal results (Polo-Peña et al., 2021).

3.6. Elements of gamification (RQ3)

As seen from Figure 7, the majority of the experiments use the point's instrument as the favoured method to implement gamification. The assignment of points represents the method used by 67.31% (N = 35) of the considered studies (well over the halfway mark). Closely following the assignment of points is the use of badges (61.54%, N = 32). In third and fourth place, we find the leaderboard (59.62%, N = 31) and competitive levels (44.23%, N = 23). Other significant gamification elements also emerge, although they are reportedly used less frequently: challenges (34.62%, N = 18), feedback (21.15%, N = 11) and rewards (21.15%, N = 11).

Although the scoring may vary in terms of mode, most gamification experiences use it as a pivotal modality. Points can be awarded to assess delivery, assignments, collaboration, or participation, all in well-defined ways. Similarly, badges are also awarded to students in specific ways and can be earned in very different ways, e.g., by reaching a goal, or handing in or taking a material. In some experiments, secret badges are also awarded, i.e. badges that are not listed among the possible outcomes that students can achieve, and are used to reward and stimulate curiosity. Particular attention must be given to these elements, as in all the retrieved studies, the authors do not consider them completely positively: whether
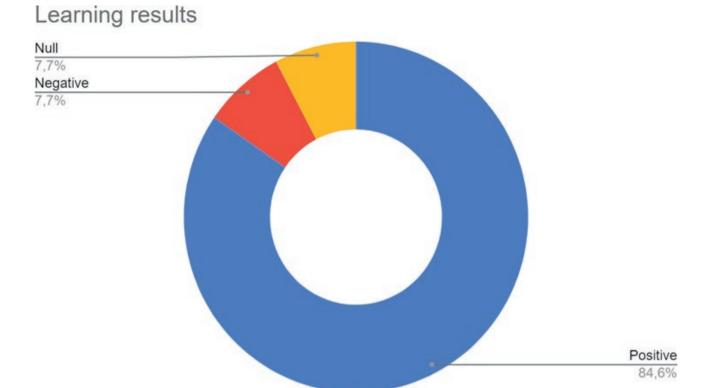
Learning results

Null
7,7%

Negative
7,7%

Positive
84,6%

Figure 8. Learning outcomes.

they list all participants or only the top ten ones, they can turn out to trigger or decrease motivation. Moreover, a leaderboard can increase motivation in all students who want to challenge for top positions or who, in general, feel stimulated to compete; however, it can become a source of demotivation for those who fail to emerge or for those who experience competition negatively (Dyjur & Lindstrom, 2017; Stefaniak & Carey, 2019). Undoubtedly, the incorporation of the challenge-feedback-reward mechanism stands out as the quintessential embodiment of the MDA (Mechanics, Dynamics, and Aesthetics) system, establishing itself as a fundamental cornerstone that profoundly influences the successful integration of functional gamification within the literature being examined. This strategic adoption not only encapsulates the very essence of the MDA system but also underscores its pivotal role in orchestrating a cohesive and engaging gamified experience. By leveraging the challenge-feedback-reward mechanism, this approach strategically aligns the mechanics, dynamics, and aesthetics of the gamification design, creating a symbiotic relationship that enhances user engagement and immersion. It serves as a unifying force, seamlessly weaving together the interactive elements of challenges, responsive feedback, and enticing rewards, thereby contributing to a well-balanced and compelling gamified environment.

3.7. Learning outcomes (RQ3)

As from the following figure, in our analysis the majority of the studies (84.6%, N = 43) report positive results, thus confirming the hypotheses put forward by the respective authors. There is an insignificant percentage (7.7%, N = 4) of studies in which the research questions do not receive relevant support from the collected data, or in which no differences are noted among the outcomes before

students' exposure to gamification and those after their exposure to gamification, or there are no differences between study groups and control groups. All these studies have been assigned a null in this SLR (see figure). A third group of studies answered negatively to their research questions /hypotheses because of their experiments; again, however, this group constitutes a very small part (7.7%, N = 4) of the total number of cases analysed.

Some studies point to negative consequences when the environment becomes competitive and this turns out to be unhealthy, or when there are situations in which male and female students aim exclusively at winning instead of learning. There are also studies which point out that without the right balance between content and gamification, the encouraging results previously underlined are not achieved, since not all participants find gamification fun or stimulating and there may be differences in reactions according to gender, age, character (introverts and extroverts have very different characteristics), frequency, or mode of approach to the game/videogame. Furthermore, there are scholars who point out the impacts on particularly introverted people and others who simply do not notice any difference in their experiments between groups exposed to gamification and control groups.

4. Thematic analysis results

This section aims to consolidate the SLR results through a thematic analysis of the included articles. The aim of a section is to extract and group the studies thanks to a thematic analysis (Braun & Clarke, 2006) to provide a conceptual map of the relationships among themes. One of the tools on which we have relied to complete the thematic analysis is the "meta-summary", especially the results that this has returned us. We calculated the frequency and intensity for each theme, indicating the number of studies with similar results and the concentration of results within the same study. Themes were identified inductively, starting from the data obtained from the articles considered.

4.1. Keywords chosen by the authors

The keywords chosen by the authors are a fundamental aspect, as they should reflect the main topics / concepts addressed in the studies according to their respective authors. In Figure 9, the distribution of the keywords is shown.

Obviously, the most-used keyword is 'gamification'. 'Motivation' is the second-most used keyword (13.4%, N = 7), followed by 'higher education' (11.5%, N = 6), and 'engagement' (9.62%, N = 5). Notably, 'game elements' and 'teaching strategies' share the same percentage level in terms of usage (7.6%, N = 4). 'Teaching strategies' is commonly used to describe implemented game elements or gamification itself, although gamification transcends a mere strategy, representing a distinct methodology with specific design elements. Terms like 'e-learning' or 'blended learning' have a lower level of occurrence (5.7%, N = 3).

4.2. Emerging themes

Before categorising the articles, we tagged each article with sub-themes so that every article has from one to three different nominal tags. The picture of the emerging themes proposed by us (Figure 10) is slightly different from the one coming from the keywords proposed by the authors of the retrieved paper (see Section 3.1).
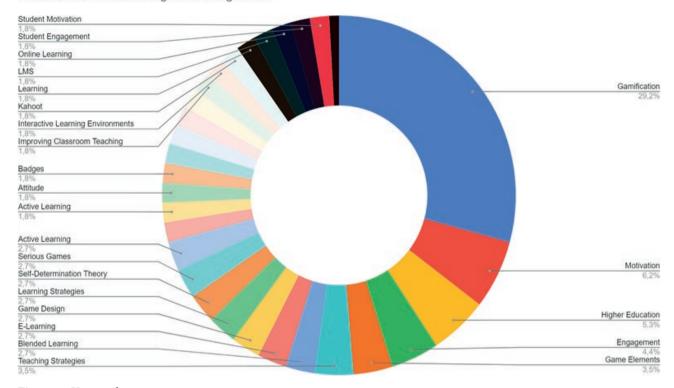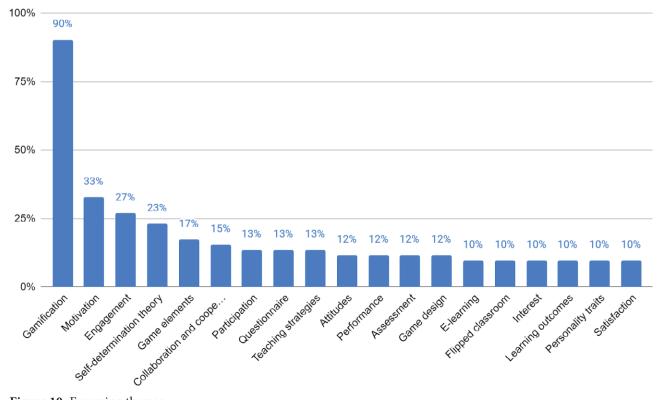
Figure 9. Keywords.

Figure 10. Emerging themes.

We can state that the theme 'gamification' is the most common in the articles selected for the SLR (90.38%, N=47). The term is followed by 'motivation' (32.69%, N = 17), 'engagement' (26.92%, N = 14), and 'self-determination theory' (SDT) (23.1%, N = 12). Once again, it is evident that gamification in higher education is perceived as a means to boost motivation, enhance student engagement, and encourage participation. Notably, the theme of SDT is significant, being often explored in studies concerning students' autonomy in choosing gamification activities. Some studies evaluate the skills acquired or relationships developed through gamification. Overall, the above figure illustrates that the 'gamification' theme constitutes 16.4% of all keywords, with subsequent themes – 'motivation', 'engagement', 'self-determination theory', and 'participation' – following with lower percentages of 6.7%, 5.5%, 4.7%, and 2.7%, respectively, in terms of their intensity relative to the entire set of themes.

4.3. Emerging statements

The emerging themes coming from the nominal tags presented in the previous section, was then broken down into 11 significant 'statements' repeated across the various considered studies.

Table 3 details the frequency and intensity emerging from the retrieved articles. This classification takes into account the possibility of associating more than one statement with one paper. The statement that is mostly associated with papers (N=30) is "Better performances through gamification", while those that are the least associated (N=4) are "Improving gamification from feedbacks" and "Comparison between different types of gamification". The column 'Percentage frequency' was calculated relative to the total number of studies considered (N=53), the column 'Percentage intensity' was calculated relative to the total frequency of the themes themselves (N=139).

According to the table, it seems the greatest interest lies in increasing student performance: more than half of the articles (57.69%, N = 30) address it; in fact, this corresponds to 21.6% of the recurrence of the statements. This is followed by the increase in participation (with a frequency in articles of 48.07% [N = 25] and an intensity of 17.9%), better learning (with a frequency in articles of 38.46% (N = 20) and an intensity of 14.3%), and more motivation (with a frequency on articles of 23.07% (N = 12) and an intensity of 11.5%). We observe that the division into statements is in line with what emerges in the section on keyword analysis and indeed confirms the scientific literature on the subject.

5. Conclusions

This SLR focuses on the implementation of gamification in higher education and addresses the proposed research questions with the aim to better understand the state of the art in the sector. This study helped to identify the following open issues:

- The first relates to the fact that we retrieved studies that analyse the topic uniformly at the theoretical level, but not at the empirical level.
- The second relates to the elements that can be implemented in a gamification course. Since they are highly varied and quite different from each other, the teacher and researcher can exercise discretion over which elements to implement and for which teaching purposes, thus making gamification adaptable and flexible for individual needs.
- The third relates to the other side of the coin: such flexibility and adaptability of gamification so far has not yet allowed the definition of any functional and working model for gamification at the higher-education level.

Table 3. Emerging statements (Frequency and intensity).

Statement	Frequency	Percentage frequency	Percentage intensity
Better performances through gamification	30	57.69%	21,58%
More participation through gamification	25	48.07%	17,99%
Better learning through gamification	20	38.46%	14,39%
Students' perceptions on gamification	16	30.77%	11,51%
More motivation through gamification	12	23.07%	8,63%
Personal influences of students on gamification results/attitudes	11	21.15%	7,91%
Better behaviour/interaction of students	9	17.31%	6,47%
Examination of student attitudes	6	11.54%	4,32%
More satisfaction in students	4	7.69%	2,88%
Improving gamification from feedbacks	3	5.77%	2,16%
Comparison between different types of gamification	3	5.77%	2,16%
Total	139	/	100%

Concluding this systematic literature review, it is evident that the integration of games into college education is a multifaceted endeavour. However, it is crucial to acknowledge the inherent limitations of this comprehensive examination. Firstly, the extant literature may not encompass every facet of gamification in higher education, and the dynamic nature of both educational practices and technology implies that newer developments may emerge post-review. Additionally, the heterogeneity in methodologies across the examined studies may pose challenges in synthesizing conclusive insights.

While this review provides valuable insights into the theoretical underpinnings and practical applications of gamification in higher learning, the practical implementation of these findings demands careful consideration of contextual factors, institutional dynamics, and evolving pedagogical paradigms. The transition from theory to practice necessitates a nuanced approach, acknowledging the diverse educational landscapes and adapting gamification strategies accordingly.

Looking forward, the future research agenda should focus on bridging the gap between theory and practice in gamified education. This involves not only refining theoretical frameworks, but also delving into the real-world implications of gamification within varied academic settings. Moreover, efforts should be directed towards establishing robust methodologies for assessing the effectiveness of gamification in higher education. This entails developing comprehensive metrics, innovative tracking mechanisms, and longitudinal studies to gauge the long-term impact on student learning outcomes.

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