Italian Journal of Educational Technology, 32(3), 7-23, 2024
ISSN 2532-4632 (print) – ISSN 2532-7720 (online)
DOI: 10.17471/2499-4324/1355
https://ijet.itd.cnr.it

Italian Journal of Educational Technology

ISTITUTO TECNOLOGIE DIDATTICHE

From theory to practice: A systematic literature review of Gamified Flipped Learning in higher education

Dalla teoria alla pratica: una revisione sistematica della letteratura sul Gamified Flipped Learning nell'istruzione superiore

Giada Marinensi[A], Matilde Di Lallo[A], Giancarlo De Matteis[A], Riccardo Pizolli[A], Marc Romero Carbonell[B]

A Link Campus University, Rome, Italy, g.marinensi@unilink.it, m.dilallo@unilink.it, giancarlo.dematteis@unilink.it, r.pizolli@unilink.it*
B Universitat Oberta de Catalunya, Barcelona, Spain, mromerocar@uoc.edu
** Corresponding author*

HOW TO CITE Marinensi, G., Di Lallo, M., De Matteis, G., Pizolli, R., & Carbonell, M. R. (2024). From theory to practice: A systematic literature review of Gamified Flipped Learning in higher education. *Italian Journal of Educational Technology*, *32*(3), 7-23. https://doi.org/10.17471/2499-4324/1355

Received: July 19, 2024; *Accepted:* October 10, 2024; *First Published:* December 06, 2024

ABSTRACT Gamified Flipped Learning (GFL), a pedagogical approach that combines the methodology of flipped learning with gamification techniques, has gained increasing attention in recent years, particularly within the context of higher education. This systematic literature review aims to provide educators and researchers with a comprehensive understanding of how GFL has been implemented and with what results. Following the PRISMA guidelines, 26 studies were selected and analysed. The findings indicate that this research field is still evolving and exhibits a high degree of diversity, both in terms of implementation approaches and research methods. This high level of variability is indicative of the flexibility of the approach, but it also presents a challenge for educators wishing to implement it. In light of the aforementioned findings, a set of design principles derived from the analysis is proposed to guide effective GFL practice and assist educators in successfully adopting GFL strategies.

KEYWORDS Teaching/Learning Strategies; Gamification; Game Elements; Active Learning.

SOMMARIO Il Gamified Flipped Learning (GFL), ossia l'approccio pedagogico che combina la metodologia del flipped learning con le tecniche di gamification, ha guadagnato una crescente attenzione negli ultimi anni, in particolare nel settore dell'istruzione superiore. Questa revisione sistematica della letteratura intende offrire a educatori e ricercatori una visione d'insieme di come il GFL sia stato implementato e con quali risultati. Seguendo le linee guida PRISMA, un totale di 26 studi è stato selezionato e analizzato. I risultati indicano che questo campo di ricerca è ancora in evoluzione e presenta un alto grado di diversità, sia in riferimento alle modalità di implementazione che ai metodi di ricerca. Questo alto livello di variabilità è indicativo della flessibilità dell'approccio, ma rappresenta anche una sfida per gli educatori che desiderano implementarlo. Alla luce di questi risultati, vengono quindi proposte delle linee guida per supportare gli educatori ad adottare con successo il GFL.

PAROLE CHIAVE Strategie di insegnamento/apprendimento; Gamification; Elementi di Gioco; Apprendimento Attivo.

1. Introduction

The Bologna Declaration and the establishment of the European Higher Education Area (EHEA) have been the driving forces behind the significant changes occurring in the university environment in recent years, creating the conditions for a radical rethinking of teaching and learning practices (López, 2017). This process is closely intertwined with another ongoing revolution, digital transformation, driven by the increasingly pervasive diffusion of digital technologies and network applications in all organisations. This transformation has been slow in universities, often favouring traditional forms of teaching, until the advent of the COVID-19 pandemic which, by forcing the sudden overcoming of these resistances, has highlighted the crucial role that digital technologies can play in teaching and learning processes (Rodríguez-Abitia & Bribiesca-Correa, 2021).

However, people, particularly students and teachers, and not technologies, remain the pivotal element in the digital transformation process ongoing in Higher Education Institutions (HEIs) (Gaebel et al., 2021). Therefore, digital technologies should be experimented with in terms of their ability to support more student-centred approaches and active learning strategies. Among the various active learning strategies (Misseyanni et al., 2018), flipped learning and gamification have been widely applied at university level (Baig & Yadegaridehkordi, 2023; Pelizzari, 2024) and have often been combined together to originate what is known as gamification enhanced flipped learning or gamified flipped learning (GFL). The COVID-19 crises further accelerated the adoption of these approaches, due to the fact that the transition to online learning highlighted the need for strategies that could foster student engagement and motivation in virtual environments (Collado-Valero et al., 2021; Divjak et al., 2022).

1.1. Gamified flipped learning

Flipped learning, a pedagogical approach in which students' initial exposure to new theoretical content occurs at home through self-paced learning, while class time is devoted to collaborative learning activities such as problem solving, discussion, and creative tasks (Bergmann & Sams, 2012; Brame, 2013; Talbert, 2017), has become increasingly popular among educators due to its alignment with the preferences of contemporary learners and its potential to foster deeper engagement and understanding (Bergmann & Sams, 2012; Talbert, 2017).

At the same time, gamification, the integration of game elements into non-game contexts, has gained attention as a way to motivate students and promote positive learning behaviours (Deterding et al., 2011; Landers, 2014) especially at the Higher Education (HE) level (Irwanto et al., 2023; Pelizzari, 2024). The design and evaluation of gamified learning interventions are frequently grounded on the Self-Determination Theory (SDT) (Krath et al., 2021).

Several research studies have explored the combination of flipped learning and gamification (Choi & Choi, 2021) reporting encouraging results, such as the positive impact of gamification on student engagement in both out-of-class (Huang & Hew, 2018a) and in-class activities (Zainuddin, 2018); the positive impact on the level of students' learning outcomes (Hung, 2017; Yildirim, 2017) and on their overall perceptions of the course (Hung, 2017).

1.2. Previous review studies

Two literature reviews have been conducted to systematise the existing findings in the field of GFL. The first one was conducted by Ekici (2021), analysing a total of 22 research articles published in aca-

demic journals between 2016 and 2019. This review encompassed GFL experiences implemented across all educational levels. The second systematic literature review was conducted by Smith et al. (2022), which examined 92 papers from journals and conferences indexed in the Scopus database and published between 2015 and April 2021. This review had a broader focus, incorporating both flipped learning experiences augmented with games and those utilising gamification techniques.

1.3. Purpose of the study

Although both literature reviews made valuable contributions to enhancing researchers' and practitioners' understanding of GFL, it is important to acknowledge certain limitations. Firstly, the inclusion of studies conducted across all educational levels presents challenges in assessing the effectiveness of the approach within specific educational settings and understanding its impact on distinct target audiences. Additionally, the review conducted by Smith et al. (2022) encompassed studies that examined both the combination of flipped learning with games and the combination of flipped learning with gamification. However, designing and implementing an educational game or a gamified intervention requires different activities, efforts, and expertise from the teachers' perspective. Furthermore, the experience of students also differs depending on whether games or gamification techniques are employed.

Hence, this literature review aims to narrow its focus on studies conducted exclusively within the HE level, specifically examining the integration of flipped learning and gamification (excluding studies involving serious games, commercial games, etc.). The ultimate objective is to provide researchers and educators in HEIs with a comprehensive understanding of the implementation and outcomes of GFL thus far. The review seeks to highlight the encountered challenges and derive valuable insights from the existing literature. By doing so, it aims to offer guidelines for instructors interested in adopting this approach and to researchers who aim to further advance knowledge in this field.

2. Methodology

The process adopted to carry out this systematic review was based on the recommendations of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 statement (Page et al., 2021). The PRISMA guidelines, through a 27-item checklist, establish an optimal process to guide the researcher in conducting a systematic literature review. Accordingly, the systematic review process applied in this study consisted of the following steps: Definition of research questions; Specification of eligibility criteria and sources of information; Identification of search strategies; Study selection process; Data extraction and synthesis.

2.1. Definition of research questions

Besides identifying the general characteristics of the analysed studies, the following Research Questions (RQ) were defined to guide this literature review:

- (RQ1) Which game elements are implemented in GFL in HE?
- (RQ2) What are the challenges faced by HE teachers in the implementation of GFL?
- (RQ3) Which guiding principles can be derived from the analysed empirical studies to inform the design of a GFL intervention in HE?

2.2. Specification of eligibility criteria and sources of information

For the selection of the studies to be included in the analysis, the following Inclusion Criteria (IC) and Exclusion Criteria (EC) were specified:

- (IC1) Studies published in English (but not necessarily conducted in English).
- (IC2) Original research.
- (IC3) Studies that specifically used gamification in conjunction with flipped learning and are based on empirical evidence.
- (IC4) Studies conducted at the HE level.
- (EC1) Articles published in the proceeding of a conference or in non peer-reviewed journals, literature reviews, short papers, position papers or panels.
- (EC2) Full papers not available.

Taking into account the multidisciplinary nature of gamification, and in light of other recent mapping and systematic reviews on educational gamification and flipped learning (Akçayır & Akçayır, 2018; Bredow et al., 2021; Kalogiannakis et al., 2021; Krath et al., 2021; Manzano-León et al., 2021; Smith et al., 2022) the scientific databases searched in this review included those identified as relevant to psychology, education, gaming, technology, and social science: ACM Digital Library; EBSCO (Business Source Complete, Communication & Mass Media Complete, Teacher Reference Center); IEEE Xplore; Science Direct; Scopus; Web of Science.

2.3. Identification of search strategies

Having checked and tested the specific syntax required by each database selected, the following search string was created through the combination of two basic boolean operators ("AND" and "OR"), the parentheses and using "*" as a wildcard: "gamif* AND ((flipped OR inverted) AND (class* OR learning OR education OR instruction OR teaching))".

A decision was made to manually filter for the targeted level of education rather than include a direct reference to 'higher education' in the search string, to ensure that studies which were relevant, but did not explicitly mention 'higher education' in their titles, abstracts, or keywords, were not overlooked.

The search string was employed for title, abstract, and author keywords search, without any chronological filter. The search was conducted between March 1st and March 15th, 2023.

2.4. Study selection process

The initial search in all databases produced a total of 496 results. A first screening process was carried out and resulted in 315 papers, after duplicates were removed with the help of CADIMA software. The next stage of this review process was the removal of papers considered not relevant, according to the inclusion and exclusion criteria previously mentioned. An initial screening was conducted by four researchers who independently reviewed titles and abstracts. Before starting the selection process, a consistency check was performed using the CADIMA software to measure inter-rater agreement. Each researcher assessed the same 30 titles and abstracts independently, and the level of agreement was deemed 'fair,' with a kappa value of 0.41. Then, each title and abstract was reviewed by two researchers independently and if inconsistencies in the rating decisions occurred, the respective reviewers were notified by the CADIMA software and they had to resolve those conflicts. This process led to the

Table 1. List of selected papers.

#	Authors (Year)	Journal	Country
1	Ahmed & Asiksoy (2021)	Sustainability	Cyprus
2	Anane (2022)	Frontiers in education	UAE
3	Asiksoy & Canbolat (2021)	International Journal of Engineering Pedagogy	Turkey
4	Aşıksoy (2018)	Quality & Quantity	Cyprus
5	Chen et al. (2022)	Sustainability	China
6	Durrani et al. (2022b)	Contemporary Educational Technology	UAE
7	Durrani, Al Naymat, et al. (2022a)	International Journal of Management Education	UAE
8	Elzeky et al. (2022)	BMC Nursing	Egypt
9	Forndran & Zacharias (2019)	European Journal of Psysics	Brazil
10	Gómez-Carrasco et al. (2019)	Education Sciences	Spain
11	Gündüz & Akkoyunlu (2020)	SAGE Open	Turkey
12	Huang et al. (2019)	Interactive Learning Environments	Hong Kong
13	Huang & Hew (2018a)	Computers and Education	Hong Kong
14	Huang & Hew (2018b)	Computers and Education	Hong Kong
15	Hung (2018)	ELT Journal	Taiwan
16	Hung (2017)	Interactive Learning Environments	Taiwan
17	Kim & Kim (2022)	Healthcare	Korea
18	Ng & Lo (2023)	Education Sciences	China
19	Ng & Lo (2022)	Sustainability	China
20	Ozer et al. (2018)	International Journal of Emerging Technologies in Learning	Cipro
21	Recabarren et al. (2023)	Interactive Learning Environments	Chile
22	Ruiz (2021)	Journal of Spanish Language Teaching	Singapore
23	Sailer & Sailer (2021)	British Journal of Educational Technology	Germany
24	Yllana-Prieto et al. (2021)	Sustainability	Spain
25	Zainuddin et al. (2022)	Interactive Technology and Smart Education	Indonesia
26	Zamora-Polo et al. (2019)	Education Sciences	Spain

exclusion of 160 articles. Two researchers assessed the full text of 155 remaining articles and discarded another 130 articles.

Hence, 25 papers were included for data extraction, however, one of the papers encompassed two separate studies, resulting in a total of 26 studies to be analysed (Table 1). The selection process is illustrated in the following flow diagram (Figure 1).

2.5. Data extraction

Four researchers examined the data from all 26 studies included at the end of the selection process. The analysis was performed by coding the data and assigning them to various categories. These categories were initially established by two of the authors, drawing upon existing literature. For instance, the classification of game elements in the selected studies was based on the game element taxonomy proposed by Toda et al. (2019). Subsequently, the categories were presented and discussed among the entire research team to ensure validation and refinement. In the process of analysis, additional categories were introduced as deemed necessary.

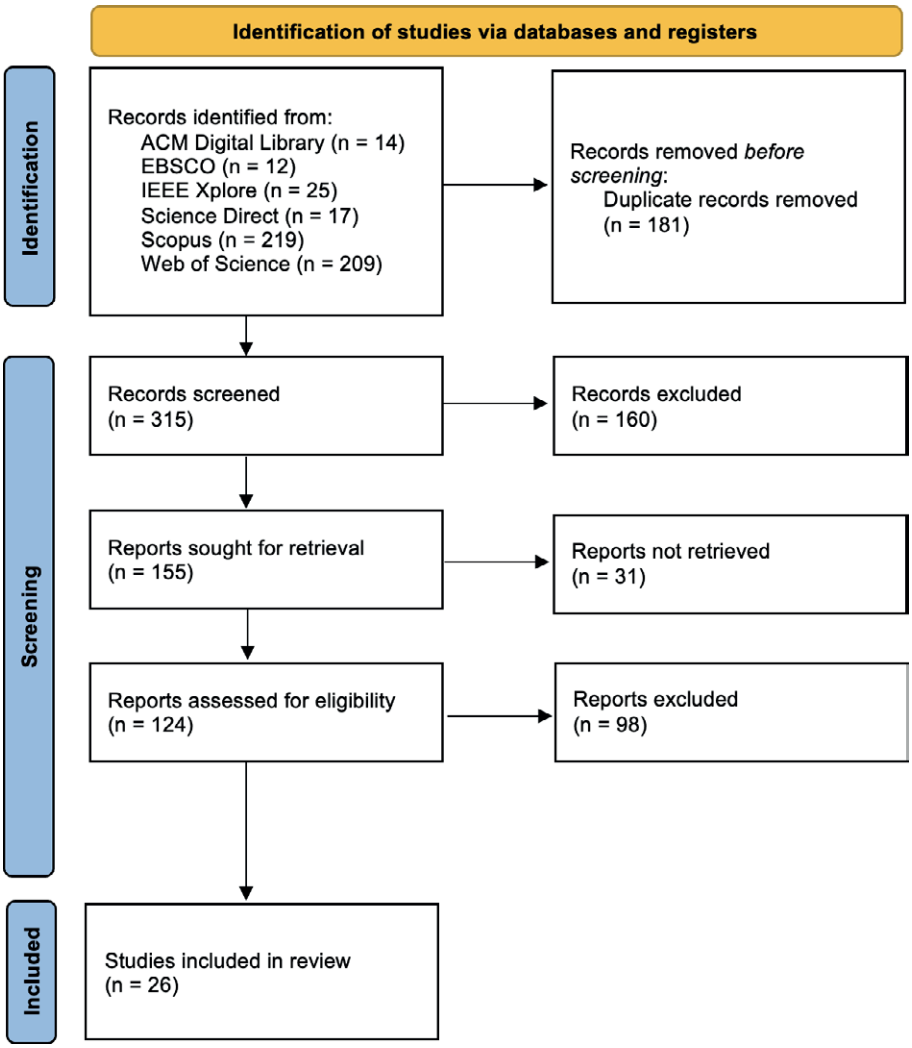

Figure 1. Flow diagram of the article search and selection process.

3. Results

3.1. General characteristics of the analysed studies

Although the search in academic databases was not limited to a specific time frame, it is noteworthy that most of the studies have been published after 2020 (Figure 2).

Most of the studies reviewed (16 out of 26) were carried out in undergraduate programmes (Figure 3).

The rationale for favouring undergraduate courses is likely attributable to their usually larger student population, as these allow researchers to have sufficient participants for their investigations, especially in the context of quantitative and mixed methods research, the only methodological approaches adopted among the selected studies. Indeed, half of the selected studies employed a mixed-methods approach, while the other half used a quantitative approach.

In most of the studies (18 out of 26), the course was delivered in blended learning mode (Figure 4). Blended learning can be defined as a combination of teaching strategies that incorporates digital technologies into teaching practices, occupying an intermediate position between fully online and ful-

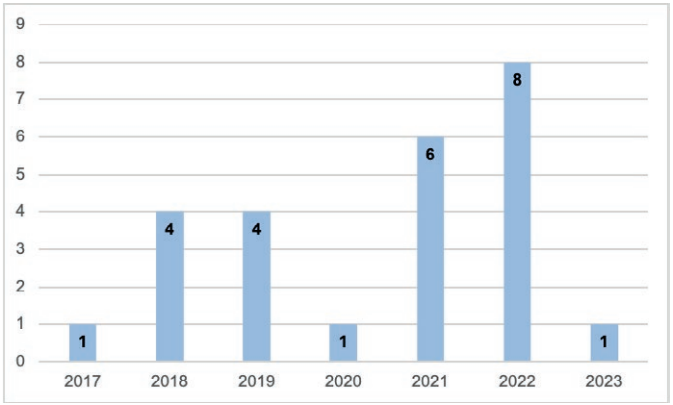

Figure 2. Distribution of the studies per publication year.

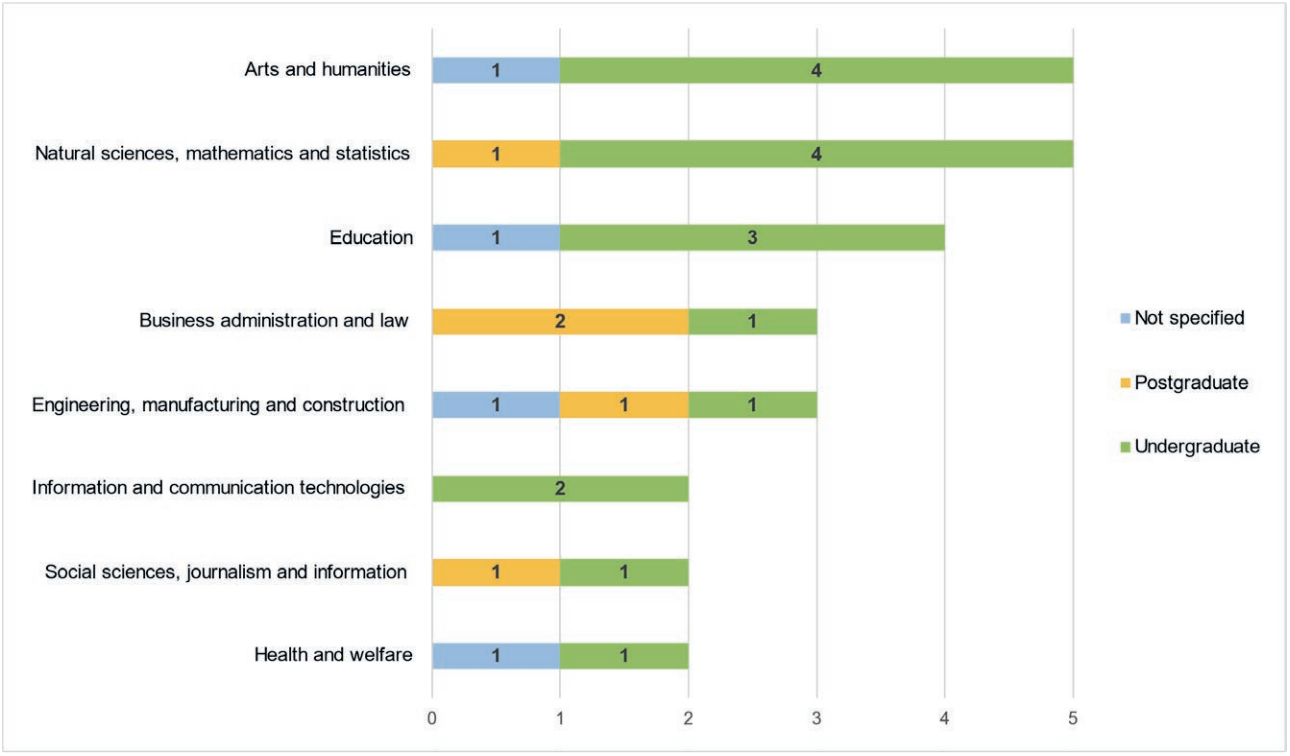

Figure 3. Distribution of the studies per course level and subject area.

ly face-to-face delivery modes (Wang et al., 2015); instead, hybrid learning happens when online and in-person learning are offered at the same time and learners can choose to attend online or in-person (Marey et al., 2022). The fully online delivery mode (7 studies out of 26, 26.9%) was the only one adopted during the pandemic, due to the restrictions imposed by the authorities.

Regarding how gamification is used, most of the analysed experiences apply gamification only to specific course activities (21 out of 26) instead of applying it to the entire course structure (5 out of 26) (Figure 5).

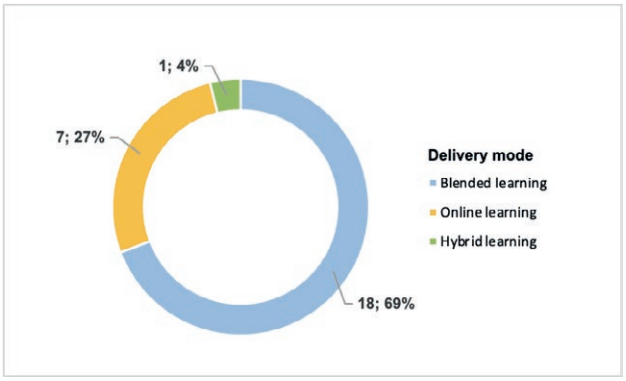

Figure 4. Courses' delivery mode.

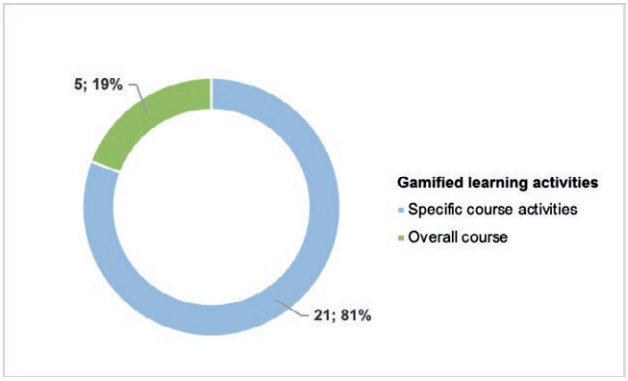

Figure 5. Gamified learning activities course coverage.

Table 2. Reported results of the GFL interventions.

Reported results	Definition		# of studies
Positive	Improvement in the observed(s) as a consequence of implementing GFL		21
Negative	Adverse impact of GFL on the observed variable(s)		0
Mixed	variable Improvements in some variables and adverse effects on others	mostly positive	4
		equal positive and negative	1
		mostly negative	0
No effect			0

This review also focused on highlighting the variables on which the effect of the gamified learning intervention was observed across the 26 included studies. An initial list of variables based on the literature (Ekici, 2021) was adopted as a reference, but the final list was defined through basic coding and discussion among researchers. The most frequently measured variables were motivation (n=14), learning achievements (n=14), engagement (n=12) and perception (n=11).

From the analysis of the studies, a synthesis of the reported results was also drawn (Table 2), based on the categories adopted by Smith et al. (2022) and Luo (2022).

3.2. RQ1 – Game elements implemented in GFL

To identify the most used game elements in the selected studies, it was first necessary to select a taxonomy of game elements to be adopted as a reference. Indeed, game elements have been classified in many ways by different authors, but taking into account the context of this study, it was decided to adopt the taxonomy provided by Toda et al. (2019), which was defined with the specific aim of standardising the naming and the definition of game elements employed for educational gamification.

Based on this taxonomy, the most frequently used game elements in the analysed studies are points (n=23) and competition (n=22), specifically referring to the use of leaderboards, followed by acknowledgements (n=11), in the forms of badges and trophies (Table 3).

Moreover, in many of the studies analysed, researchers adopted ready-to-use tools to implement gamification, in particular gamified student response systems (such as Kahoot!, Socrative, Quizalize), instead of designing an ad hoc gamified solution.

Table 3. The most used game elements in GFL interventions.

Game elements	# of studies
Point (e.g., experience points)	23
Competition. (e.g., player versus player battles, leaderboards)	22
Acknowledgement (e.g., badges, medals, trophies)	11
Cooperation (e.g., co-op missions, group challenges)	8
Progression (e.g., progress bars, maps, steps)	6
Level (e.g., character levels, skill level)	6
Time pressure (e.g., countdown, clock, timer)	6
Objectives (e.g., quests, missions, milestones)	6
Stats (e.g., health bar, magic bar, skills)	2
Rarity (e.g., limited resources and collectables)	2
Economy (e.g., a virtual currency to be used for transactions)	2
Social pressure (e.g., peer pressure, guild missions)	2
Reputation (e.g., titles, status, ranking)	2
Puzzles (e.g., actual puzzles, cognitive tasks, mysteries)	2
Sensation (e.g., visual and sound effects)	2
Storytelling (e.g., animated scenes, audio queues or text queues)	2
Chance (e.g., elements of randomness or probability)	1
Interactive narrative (i.e., choices or performances in the system that influence the progression of the story and its ending)	1
Imposed choices (e.g., judgements, forced choices)	0
Novelty (e.g., changes, surprises, updates)	0
Renovation (e.g., extra life, boosts, renewal)	0

3.3. RQ2 – Challenges faced in GFL implementation by the HE teachers

Throughout the analysis, the researchers identified and categorised specific references to challenges encountered at various stages of the implementation process and affecting either the teachers or the students. These challenges were organised into five categories, initially formulated based on existing literature (Akçayır & Akçayır, 2018; Lester et al., 2023; Lo & Hew, 2017), and subsequently refined during the data extraction phase (Table 4).

3.4. RQ3 – Guiding principles informing the design of GFL

To address the challenges described in the selected studies, and to offer guidance to the teachers, some design principles can be derived both from the theories underpinning flipped learning and educational gamification and from the studies carried out so far. For each challenge, the corresponding guiding principles, either related to one of the components of GFL (flipped learning and gamification) or to the overall design, are listed in Table 4 and then described below.

Offer flexibility. Allow students to access individual space at any time and any place and study theoretical content at their own pace, and if possible, provide access to alternative materials to study the same content, enabling them to choose what best suits their learning style, needs and level of mastery (Akçayır & Akçayır, 2018; Bergmann & Sams, 2012).

Strive for wider appeal. Implementing a gamified system based only on a limited amount of game elements, such as points, badges and leaderboards, can feel like a safe option for inexperienced gam-

Table 4. Challenges faced in the implementation of GFL.

Challenge category	# of studies	Example Quote
The same solution is not equally effective for all learners	12	"Girls perceived a greater effect of the program on motivation than boys, just as they thought they had learned more and that they valued the strategies employed more positively than their male peers" (Gómez-Carrasco et al., 2020, p.11)
Class management issues	10	"The instructor introduced these rules at the beginning of the course. However, he did not actually ensure that each student understood the rules clearly. As a result, some students were confused about the rules for earning the game elements (e.g. how to earn the quality-based badges). Their engagement in the initial weeks was thus impaired." (Huang et al., 2019, p.17)
More time-consuming and difficult to design than a traditional course	9	"[Teachers] must prepare much more digital instruction and video than traditional instruction" (Ng & Lo, 2023, p.13)
Lack of digital skills	5	"All participants (i.e., teachers, teaching assistants and students) mentioned the need for technical support" (Ng & Lo, 2023, p.13)
Higher student workload compared to a traditional course	3	"FL requires active participation both inside and outside the classroom. Consequently, it requires more time and effort than what is required in traditional learning methods" (Kim & Kim, 2022, p.8)

Table 4. Guiding principles.

Challenges	Guiding principles		
	Flipped learning	Gamification	General
The same type of solution is not suitable for all types of learners	Offer flexibility	Strive for wider appeal	
Class management issues	Design a cohesive learning experience	Favour collaboration over competition	Communicate openly
More time-consuming and difficult to design than a traditional course	Mix created and curated content		Provide feedback
Lack of digital skills			Do not overcomplicate technical aspects
Higher student workload compared to a traditional course	Ensure manageable workload	Design an overall pleasurable and fun experience	

ification designers. However, including more game elements can be a better option to appeal also to learners who are less motivated by these specific game elements (Marczewski, 2018; Werbach & Hunter, 2012).

Design a cohesive learning experience. To prevent student confusion, the connection between the contents provided in the individual space and the activities foreseen in the group space should be explicit and meaningful. Individual space and group space activities should support each other as part of the complete flipped classroom design (Hwang et al., 2019).

Favour collaboration over competition. Competition can lead to class dynamics that are difficult to manage, so it may be preferable to implement cooperative rather than competitive gamification (An,

2020), or to implement intergroup competition to try to combine the benefits of both competition and cooperation (Morschheuser et al., 2019).

Communicate openly. The teacher should provide students with a clear overview of how a gamified flipped learning course works and what is expected from them and keep an open dialogue with the students throughout the course (Hwang et al., 2015).

Mix created and curated content. To reduce the time and effort needed when preparing a new flipped learning course, a viable strategy is to combine the creation of new content and the curation of good quality open educational resources already available (Bergmann & Sams, 2012; Talbert, 2017).

Provide feedback. A gamified flipped learning course should be designed to provide as many opportunities as possible to give individual feedback to students on their learning progress (Bergmann & Sams, 2012; Kapp, 2012; Sakulprasertsri, 2017). Rewards in a gamified system (such as badges, achievements, trophies, and points) should be intended as a way of giving feedback on users' performance (Marczewski, 2018).

Do not overcomplicate technical aspects. Learning technologies implemented in both the individual and group space of a gamified flipped course should be easy to use and should not be a barrier for either students or teachers (Vanduhe et al., 2020).

Ensure a manageable workload. Students should not perceive that the adoption of the flipped learning approach resulted in an increase in study time and/or workload associated with the course (Akçayır & Akçayır, 2018).

Design an overall pleasurable and fun experience. The whole point of gamifying a course is to leverage the power of games in an educational context and to create a more game-like experience (Kapp, 2012). Therefore, interacting with a gamified system should be perceived as pleasurable and enjoyable, since perceived enjoyment has been considered as an intrinsic motivational driver (Davis et al., 1992).

4. Discussion

As with the preceding systematic reviews on GFL (Ekici, 2021; Smith et al., 2022), all the studies included in the present review were published after 2016, showing that GFL is a relatively young research area. Findings also highlighted that in less than a decade the interest in this approach has risen significantly, receiving further impetus during, and in the aftermath of, the Covid-19 crises (14 out of the 26 retrieved studies were carried out between 2020 and 2022). Most of the studies reviewed (16 out of 26) were conducted in undergraduate programs. The most common subject areas for the GFL interventions included Arts and Humanities (19.2%), Natural Sciences, Mathematics, and Statistics (19.2%), and Education (15.4%).

Notably, under the same umbrella term of GFL, a wide range of solutions has been developed. The interventions described in the selected studies were indeed distributed between blended (69%) and online delivery modes (27%); foresaw the implementation of game elements in out-of-class activities (27%), in-class activities (38%), or both (35%); applied gamification to a limited number of learning activities (81%), or adopted a more structural approach, gamifying the entire course (19%).

This level of variability testifies to the inherent flexibility of GFL. Indeed, as with flipped learning itself (O'Flaherty & Phillips, 2015), GFL appears to be adaptable to diverse contexts, learning requirements, and course subjects and levels. At the same time, this flexibility represents a challenge for teachers, who are burdened with the complex and time-consuming task of translating the multifaceted concept of GFL into practice (Durrani et al., 2022; Hung, 2017; Kim & Kim, 2022; Ng & Lo, 2023; Sailer & Sailer, 2021; Zamora-Polo et al., 2019).

When analysing the game elements which are implemented in GFL in HE (RQ1), despite the numerosity of game elements that could be deployed in gamified system, it is evident that the experiences based on the use of points, acknowledgements and competition are still predominant; even in light of the literature identifying this kind of gamification as controversial and of limited effectiveness, especially in motivating users in the medium and long term (Dicheva et al., 2018; Nacke & Deterding, 2017; Toda et al., 2018; Werbach & Hunter, 2012). Moreover, many of the studies relied on ready-to-use tools and applied gamification solely to specific course activities instead of attempting to achieve a more organic integration between instructional design and gamification design. An explanation can be found when analysing the challenges faced by HE teachers in the implementation of GFL (RQ2). Indeed, it appears that designing a GFL intervention is considered a time-consuming activity by many authors (35% of the selected studies), especially when they approach this method without previous knowledge of either flipped learning or gamification. In addition, introducing GFL can result in issues in the management of the class, and requires giving students precise instructions on the game elements introduced in order to avoid misunderstanding, which may result in students becoming frustrated over the method, or even the course itself (Huang et al., 2019). These challenges may be what motivate many teachers to adopt a basic gamification approach or resort to ready-to-use tools. Consequently, the progress "*from points/badges/leaderboards to other features and aspects of game design*" observed by Nacke & Deterding (2017) in gamification research, has yet to happen in GFL research.

Among the main challenges of GFL, one of the most critical challenges of flipped learning reported in the literature is notably absent (Akçayır & Akçayır, 2018), namely the problem of students coming to class unprepared. Hence, it appears that introducing gamification in flipped learning does have a mitigating effect on this challenge.

Despite the previously highlighted limitations, the reported results of GFL interventions are generally positive and encouraging. The implementation of this approach contributes to fostering students' motivation, learning achievements and engagement. Moreover, this approach seems to be generally well received by the students and its implementation has also been reported to improve the students' overall perception of the course.

Nevertheless, it is important to highlight that one of the most frequently mentioned challenges in the analysed studies is the inherent variability in students' responses to specific game elements. Thus, offering a diversified gamified system may prove to be a more effective strategy to meet the needs and expectations of the collective class cohort, as underscored by other researchers in the field of gamification (Kocadere & Çağlar, 2018; Manzano-León et al., 2021). In addition, the growing field of research focusing on the integration of gamification and artificial intelligence to design adaptive gamified learning environments is very promising and could shortly offer interesting solutions to address this specific problem (Lavoué et al., 2019; Oliveira & Bittencourt, 2019; Serna et al., 2023).

5. Conclusions

This literature review focused on analysing studies conducted within HE that examine the integration of flipped learning and gamification. What emerged from the analysis of the selected studies in this relatively young and still expanding research field is that it is characterised by a wide variety of implementation approaches. This variety appears to be a strength (indicating the flexibility and adaptability of GFL) but also a weakness (requiring time to be properly designed and implemented).

Drawing from the insights that emerged from previous experiences and the promising outcomes they have reported, future educators inclined towards implementing this approach may find value in pursuing a more organic integration of gamification and flipped learning (Kocadere & Çağlar, 2018; Manzano-León et al., 2021). Moreover, a more nuanced and deliberate selection of game elements for implementation could be considered in order to overcome the limitations of the different responses each specific game element may elicit from different students (Dicheva et al., 2018; Nacke & Deterding, 2017; Toda et al., 2018; Werbach & Hunter, 2012).

Finally, the current evolution of gamification research, exploring the potentiality of artificial intelligence, could also provide beneficial insights and solutions to be applied in GFL.

6. Study limitations

In this review, specific keywords and criteria to search the scientific databases and identify relevant studies for examination were employed. This approach ensured that the final selection of studies on GFL in HE was highly representative. However, it is important to note that 31 of the 155 papers selected after the title and abstract screening could not be retrieved. Additionally, utilising different search criteria may yield slightly different data. For instance, if conference papers were included in the analysis, the reported results could vary. Therefore, further research is warranted, using alternative selection criteria, to gain a more comprehensive understanding of how, and with what impact, GFL has been implemented at the HE level.

7. References

Ahmed, H. D., & Asiksoy, G. (2021). The effects of gamified flipped learning method on student's Innovation Skills, Self-Efficacy towards *Virtual Physics Lab Course and Perceptions. Sustainability*, *13*(18), 10163. https://doi.org/10.3390/su131810163

Akçayır, G., & Akçayır, M. (2018). The flipped classroom: A review of its advantages and challenges. *Computers & Education*, *126*(August), 334–345. https://doi.org/10.1016/j.compedu.2018.07.021

An, Y. (2020). Designing effective gamified learning experiences. *International Journal of Technology in Education*, *3*(2), 62. https://doi.org/10.46328/ijte.v3i2.27

Anane, C. (2022). Gamified flipped learning in a French foreign language class: Efficiency and student perception. *Frontiers in Education*, *7*, 1–15. https://doi.org/10.3389/feduc.2022.994892

Asiksoy, G., & Canbolat, S. (2021). The effects of the gamified flipped classroom method on petroleum engineering students' pre-class online behavioural engagement and achievement. *International Journal of Engineering Pedagogy* (IJEP), *11*(5), 19. https://doi.org/10.3991/ijep.v11i5.21957

Aşıksoy, G. (2018). The effects of the gamified flipped classroom environment (GFCE) on students' motivation, learning achievements and perception in a physics course. *Quality & Quantity*, *52*(S1), 129–145. https://doi.org/10.1007/s11135-017-0597-1

Baig, M. I., & Yadegaridehkordi, E. (2023). Flipped classroom in higher education: a systematic literature review and research challenges. *International Journal of Educational Technology in Higher Education*, *20*(1), 61. https://doi.org/10.1186/s41239-023-00430-5

Bergmann, J., & Sams, A. (2012). Flip your classroom: reach every student in every class every day. *International Society for Technology in Education*. https://www.rcboe.org/cms/lib/GA01903614/Centricity/Domain/15451/Flip_your_Classroom.pdf

Brame, C. J. (2013). *Flipping the classroom*. Vanderbilt University. Center for Teaching. http://cft.vanderbilt.edu/guides-sub-pages/flipping-the-classroom/

Bredow, C. A., Roehling, P. V., Knorp, A. J., & Sweet, A. M. (2021). To flip or not to flip? a meta-analysis of the efficacy of flipped learning in higher education. *Review of Educational Research*, *91*(6), 878–918. https://doi.org/10.3102/00346543211019122

Chen, Y., Zhang, L. Y., & Yin, H. (2022). A longitudinal study on students' foreign language anxiety and cognitive load in gamified classes of higher education. *Sustainability*, *14*(17), 1–20. https://doi.org/10.3390/su141710905

Choi, J. F., & Choi, J. (2021). Development of gamification model for flipped learning. *International Journal of Crisis & Safety*, *6*(2), 68–79. https://doi.org/10.22471/crisis.2021.6.2.68

Collado-Valero, J., Rodríguez-Infante, G., Romero-González, M., Gamboa-Ternero, S., Navarro-Soria, I., & Lavigne-Cerván, R. (2021). Flipped classroom: Active methodology for sustainable learning in higher education during social distancing due to COVID-19. *Sustainability*, *13*(10), 5336. https://doi.org/10.3390/su13105336

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*. https://doi.org/10.1111/j.1559-1816.1992.tb00945.x

Deterding, S., Khaled, R., Nacke, L., & Dixon, D. (2011). Gamification: toward a definition. In *Chi 2011 Gamification Workshop Proceedings* (pp. 12–15). http://gamification-research.org/wp-content/uploads/2011/04/02-Deterding-Khaled-Nacke-Dixon.pdf

Dicheva, D., Irwin, K., & Dichev, C. (2018). Motivational factors in educational gamification. In *Proceedings - IEEE 18th International Conference on Advanced Learning Technologies*, ICALT 2018. https://doi.org/10.1109/ICALT.2018.00102

Divjak, B., Rienties, B., Iniesto, F., Vondra, P., & Žižak, M. (2022). Flipped classrooms in higher education during the COVID-19 pandemic: findings and future research recommendations. *International Journal of Educational Technology in Higher Education*, *19*(1). https://doi.org/10.1186/s41239-021-00316-4

Durrani, U. K., Al Naymat, G., Ayoubi, R. M., Kamal, M. M., & Hussain, H. (2022a). Gamified flipped classroom versus traditional classroom learning: Which approach is more efficient in business education? *International Journal of Management Education*, *20*(1), 1–22. https://doi.org/10.1016/j.ijme.2021.100595

Durrani, U. K., Hujran, O., & Al-Adwan, A. S. (2022b). CrossQuestion game: a group-based assessment for gamified flipped classroom experience using the ARCS model. *Contemporary Educational Technology*, *14*(2), 1–15. https://doi.org/10.30935/cedtech/11568

Ekici, M. (2021). A systematic review of the use of gamification in flipped learning. *Education and Information Technologies*, *26*, 3327–3346. https://doi.org/10.1007/s10639-020-10394-y

Elzeky, M. E. H., Elhabashy, H. M. M., Ali, W. G. M., & Allam, S. M. E. (2022). Effect of gamified flipped classroom on improving nursing students' skills competency and learning motivation: a randomized controlled trial. *BMC Nursing*, *21*(1), 316. https://doi.org/10.1186/s12912-022-01096-6

Forndran, F., & Zacharias, C. R. (2019). Gamified experimental physics classes: a promising active learning methodology for higher education. *European Journal of Physics*, *40*, 1–14. https://doi.org/10.1088/1361-6404/ab215e

Gaebel, M., Zhang, T., Stoeber, H., & Morrisroe, A. (2021). D*igitally enhanced learning and teaching in European higher education institutions*. https://www.eua.eu/downloads/publications/digihe%20new%20version.pdf

Gómez-Carrasco, C.-J., Monteagudo-Fernández, J., Moreno-Vera, J.-R., & Sainz-Gómez, M. (2019). Effects of a Gamification and Flipped-Classroom Program for Teachers in Training on Motivation and Learning Perception. *Education Sciences*, *9*(4), 299. https://doi.org/10.3390/educsci9040299

Gündüz, A. Y., & Akkoyunlu, B. (2020). Effectiveness of Gamification in Flipped Learning. *SAGE Open*, *10*(4), 1–16. https://doi.org/10.1177/2158244020979837

Huang, B., & Hew, K. F. (2018a). Implementing a theory-driven gamification model in higher education flipped courses: Effects on out-of-class activity completion and quality of artifacts. *Computers & Education*, *125*, 254–272. https://doi.org/10.1016/j.compedu.2018.06.018

Huang, B., & Hew, K. F. (2018b). Implementing a theory-driven gamification model in higher education flipped courses: Effects on out-of-class activity completion and quality of artifacts. *Computers & Education*, *125*(August 2017), 254–272. https://doi.org/10.1016/j.compedu.2018.06.018

Huang, B., Hew, K. F., & Lo, C. K. (2019). Investigating the effects of gamification-enhanced flipped learning on undergraduate students' behavioral and cognitive engagement. *Interactive Learning Environments*, *27*(8), 1106–1126. https://doi.org/10.1080/10494820.2018.1495653

Hung, H. T. (2017). Clickers in the flipped classroom: bring your own device (BYOD) to promote student learning. *Interactive Learning Environments*, *25*(8), 983–995. https://doi.org/10.1080/10494820.2016.1240090

Hung, H. T. (2018). Gamifying the flipped classroom using game-based learning materials. *ELT Journal*, *72*(3), 296–308. https://doi.org/10.1093/elt/ccx055

Hwang, G.-J., Lai, C.-L., & Wang, S.-Y. (2015). Seamless flipped learning: a mobile technology-enhanced flipped classroom with effective learning strategies. *Journal of Computers in Education*, *2*(4), 449–473. https://doi.org/10.1007/s40692-015-0043-0

Hwang, G.-J., Yin, C., & Chu, H. C. (2019). The era of flipped learning: promoting active learning and higher order thinking with innovative flipped learning strategies and supporting systems. *Interactive Learning Environments*, *27*(8), 991–994. https://doi.org/10.1080/10494820.2019.1667150

Irwanto, I., Wahyudiati, D., Saputro, A. D., & Laksana, S. D. (2023). Research Trends and Applications of Gamification in Higher Education: A Bibliometric Analysis Spanning 2013–2022. *International Journal of Emerging Technologies in Learning (IJET)*, *18*(05), 19–41. https://doi.org/10.3991/ijet.v18i05.37021

Kalogiannakis, M., Papadakis, S., & Zourmpakis, A. I. (2021). Gamification in science education. A systematic review of the literature. *Education Sciences*, *11*(1), 1–36. https://doi.org/10.3390/educsci11010022

Kapp, K. M. (2012). *The gamification of learning and instruction: game-based methods and strategies for training and education*. John Wiley & Sons.

Kim, H., & Kim, B. (2022). Effects of situation-based flipped learning and gamification as combined methodologies in psychiatric nursing education: A quasi-experimental study. *Healthcare*, *10*(644), 1–10. https://doi.org/10.3390/healthcare10040644

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

Krath, J., Schürmann, L., & von Korflesch, H. F. O. (2021). Revealing the theoretical basis of gamification: A systematic review and analysis of theory in research on gamification, serious games and game-based learning. *Computers in Human Behavior*, *125*, 106963. https://doi.org/10.1016/j.chb.2021.106963

Landers, R. N. (2014). Developing a theory of gamified learning. *Simulation & Gaming*, *45*(6), 752–768. https://doi.org/10.1177/1046878114563660

Lavoué, É., Monterrat, B., Desmarais, M., & George, S. (2019). Adaptive gamification for learning environments. *IEEE Transactions on Learning Technologies*, *12*(1), 16–28. https://doi.org/10.1109/TLT.2018.2823710

Lester, D., Skulmoski, G. J., Fisher, D. P., Mehrotra, V., Lim, I., Lang, A., & Keogh, J. W. L. (2023). Drivers and barriers to the utilisation of gamification and game-based learning in universities: A systematic review of educators' perspectives. *British Journal of Educational Technology*, *February*, 1–23. https://doi.org/10.1111/bjet.13311

Lo, C. K., & Hew, K. F. (2017). A critical review of flipped classroom challenges in K-12 education: possible solutions and recommendations for future research. *Research and Practice in Technology Enhanced Learning*, *12*(1). https://doi.org/10.1186/s41039-016-0044-2

López, M. A. R. (2017). european higher education area-driven educational innovation. *Procedia - Social and Behavioral Sciences*, *237*, 1505–1512. https://doi.org/10.1016/j.sbspro.2017.02.237

Luo, Z. (2022). Gamification for educational purposes: What are the factors contributing to varied effectiveness? *Education and Information Technologies*, *27*(1), 891–915. https://doi.org/10.1007/S10639-021-10642-9

Manzano-León, A., Camacho-Lazarraga, P., Guerrero, M. A., Guerrero-Puerta, L., Aguilar-Parra, J. M., Trigueros, R., & Alias, A. (2021). Between level up and game over: A systematic literature review of gamification in education. *Sustainability*, *13*(4), 2247. https://doi.org/10.3390/su13042247

Marczewski, A. (2018). *Even ninja monkeys like to play: Unicorn Edition*. Gamified UK.

Marey, A., Goubran, S., & Tarabieh, K. (2022). Refurbishing classrooms for hybrid learning: balancing between infrastructure and technology improvements. *Buildings*, *12*(738), 1–12. https://doi.org/10.3390/buildings12060738

Misseyanni, A., Papadopoulou, P., Marouli, C., & Lytras, M. D. (2018). Active learning stories in higher education: lessons learned and good practices in STEM education. In *Active Learning Strategies in Higher Education* (pp. 75–105). Emerald. https://doi.org/10.1108/978-1-78714-487-320181004

Morschheuser, B., Hamari, J., & Maedche, A. (2019). Cooperation or competition – When do people contribute more? A field experiment on gamification of crowdsourcing. *International Journal of Human Computer Studies*, *127*, 7–24. https://doi.org/10.1016/j.ijhcs.2018.10.001

Nacke, L. E., & Deterding, S. (2017). The maturing of gamification research. *Computers in Human Behavior*, *71*, 450–454. https://doi.org/10.1016/j.chb.2016.11.062

Ng, L.-K., & Lo, C.-K. (2022). Flipped classroom and gamification approach: Its impact on performance and academic commitment on sustainable learning in education. *Sustainability*, *14*, 1–23. https://doi.org/10.3390/su14095428

Ng, L.-K., & Lo, C.-K. (2023). Enhancing online instructional approaches for sustainable business education in the current and post-pandemic era: An action research study of student engagement. *Education Sciences*, *13*(42), 1–16. https://doi.org/10.3390/educsci13010042

O'Flaherty, J., & Phillips, C. (2015). The use of flipped classrooms in higher education: A scoping review. *Internet and Higher Education*, *25*, 85–95. https://doi.org/10.1016/j.iheduc.2015.02.002

Oliveira, W., & Bittencourt, I. I. (2019). Tailored gamification to educational technologies. In *Tailored Gamification to Educational Technologies*. Springer. https://doi.org/10.1007/978-981-32-9812-5

Ozer, H. H., Kanbul, S., & Ozdamli, F. (2018). Effects of the gamification supported flipped classroom model on the attitudes and opinions regarding game-coding education. *International Journal Of Emerging Technologies in Learning*, *13*(1), 109–123. https://doi.org/10.3991/ijet.v13i01.7634

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. In *The BMJ*. https://doi.org/10.1136/bmj.n71

Pelizzari, F. (2024). Gamification in higher education: A systematic literature review. *Italian Journal of Educational Technology*, *31*(3), 21–43. https://doi.org/10.17471/2499-4324/1335

Recabarren, M., Corvalán, B., & Villegas, M. (2023). Exploring the differences between gamer and non-gamer students in the effects of gamification on their motivation and learning. *Interactive Learning Environments*, *31*(6), 3529–3542. https://doi.org/10.1080/10494820.2021.1933543

Rodríguez-Abitia, G., & Bribiesca-Correa, G. (2021). Assessing digital transformation in universities. *Future Internet*, *13*(2), 1–17. https://doi.org/10.3390/fi13020052

Ruiz, C. G. (2021). The effect of integrating Kahoot! and peer instruction in the Spanish flipped classroom: the student perspective. *Journal of Spanish Language Teaching*, *8*(1), 63–78. https://doi.org/10.1080/23247797.2021.1913832

Sailer, M., & Sailer, M. (2021). Gamification of in-class activities in flipped classroom lectures. *British Journal of Educational Technology*, *52*(1), 75–90. https://doi.org/10.1111/bjet.12948

Sakulprasertsri, K. (2017). Flipped learning approach: engaging 21st century learners in English classrooms. *LEARN Journal: Language Education and Acquisition Research Network Journal*, *10*(2), 132–143. https://files.eric.ed.gov/fulltext/EJ1229623.pdf

Serna, A., Hallifax, S., & Lavoué, É. (2023). Investigating the effects of tailored gamification on learners' engagement over time in a learning environment. *Proceedings of the ACM on Human-Computer Interaction*, *7*(1). https://doi.org/10.1145/3611030

Smith, A., Legaki, N. Z., & Hamari, J. (2022). Games and gamification in flipped classrooms: A systematic review. *CEUR Workshop Proceedings*, *3147*, 33–43. https://ceur-ws.org/Vol-3147/paper4.pdf

Talbert, R. (2017). *Flipped learning. A guide for higher education faculty*. Stylus Publishing, LLC.

Toda, A. M., Cristea, A. I., Oliveira, W., Klock, A. C., Palomino, P. T., Pimenta, M., Gasparini, I., Shi, L., Bittencourt, I., & Isotani, S. (2019). A taxonomy of game elements for gamification in educational contexts: proposal and evaluation. *2019 IEEE 19th International Conference on Advanced Learning Technologies (ICALT)*, 84–88. https://doi.org/10.1109/ICALT.2019.00028

Toda, A. M., Valle, P. H. D., & Isotani, S. (2018). The dark side of gamification: An overview of negative effects of gamification in education. In A. I. Cristea, I. I. Bittencourt, & F. Lima (Eds.), *Higher education for all. from challenges to novel technology-enhanced solutions*, Vol. 832 (pp. 143–156). Springer International Publishing. https://doi.org/10.1007/978-3-319-97934-2_9

Vanduhe, V. Z., Nat, M., & Hasan, H. F. (2020). Continuance intentions to use gamification for training in higher education: integrating the Technology Acceptance Model (TAM), social motivation, and Task Technology Fit (TTF). *IEEE Access*, *8*, 21473–21484. https://doi.org/10.1109/ACCESS.2020.2966179

Wang, Y., Han, X., & Yang, J. (2015). Revisiting the blended learning literature: using a complex adaptive systems framework. *Journal of Educational Technology & Society*, *18*(2), 380–393. http://www.jstor.org/stable/jeductechsoci.18.2.380

Werbach, K., & Hunter, D. (2012). *For the win: How game thinking can revolutionize your business*. Wharton digital press.

Yildirim, I. (2017). The effects of gamification-based teaching practices on student achievement and students' attitudes toward lessons. *Internet and Higher Education*, *33*, 86–92. https://doi.org/10.1016/j.iheduc.2017.02.002

Yllana-Prieto, F., Jeong, J. S., & González-Gómez, D. (2021). An online-based edu-escape room: A comparison study of a multidimensional domain of PSTs with flipped sustainability-STEM contents. *Sustainability*, *13*, 1–18. https://doi.org/10.3390/su13031032

Zainuddin, Z. (2018). Students' learning performance and perceived motivation in gamified flipped-class instruction. *Computers & Education*, *126*, 75–88. https://doi.org/10.1016/j.compedu.2018.07.003

Zainuddin, Z., Farida, R., Keumala, C. M., Kurniawan, R., & Iskandar, H. (2022). Synchronous online flip learning with formative gamification quiz: instruction during COVID-19. *Interactive Technology and Smart Education*, *19*(2), 236–259. https://doi.org/10.1108/ITSE-01-2021-0002

Zamora-Polo, F., Corrales-Serrano, M., Sánchez-Martín, J., & Espejo-Antúnez, L. (2019). Nonscientific university students training in general science using an active-learning merged pedagogy: gamification in a flipped classroom. *Education Sciences*, *9*(297), 1–18. https://doi.org/10.3390/educsci9040297