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Integration of gamification tools in learning management systems for augmenting students' academic performance in higher education

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Abstract

Rationale of Study – The purpose of this investigation was to identify the common gamification elements and their impact on students' academic performance, the theoretical foundations of gamification as well as to investigate gamification models used in teaching and learning in higher education.

Methodology – Bibliometric analyses were used in this work to reveal the patterns and effect of implementing gamification in education.

Findings – The findings of the review confirmed that the investigation verified the widespread use of gamification elements such as badges, levels, points and leader boards. Further, self-determination theory was found playing a significant and pervasive influence in the acceptance of integrating gamification elements since they satisfy the psychological needs of competence, autonomy and relatedness in higher education.

Implications – This study recommends to the university management to encourage eLearning lecturers to incorporate a variety of gamification tools in teaching and learning in the spirit of enhancing students' interaction and engagement capabilities.

Originality – This research is important for educational policymakers, practitioners, and theorists. More research on gamification and game components in diverse educational contexts is encouraged, including experimental research approaches as well as bibliometrics analyses.

Keywords

Gamification, higher education, academic performance, gamification elements

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1 Introduction and background information

Gamification, in the words of Luis et al. (2022), is the inclusion of game aspects in non-game environments to attract attention and change student behaviour during learning. Gamification's major goal is to improve students' academic performance and final grades. Some studies reveal that gamification of traditional learning settings provides multiple advantages and benefits Department of Education (DoE, 2020). Shpakova et al. (2017) reported that gamification entails changing non-game settings into activities that resemble games but are not truly games. Gamified learning has various advantages, including the promotion of ongoing engagement and involvement, as well as the facilitation of information retention and application through strengthening higher-order thinking abilities (DoE, 2020; Kahu & Nelson, 2018).

Chapman and Rich (2018, p. 764) describe gamification in education as "a set of information and communication technology systems used in practical situations to identify and evaluate tasks, monitor progress, and engage with fellow participants." Gamification, in general, means incorporating game aspects and concepts into non-gaming activities.

Gamification has recently been a hotly disputed topic, particularly in the field of higher education, as a result of the ongoing issue of students' disinterest in completing their studies (Barna & Fodor, 2018). This issue also arises in higher education, when some students fail to complete their undergraduate coursework in the time allotted (Iosup & Epema, 2014). While gamification can boost student engagement and overall course success, it cannot address issues like poor material quality and ineffective teaching methods (Barna & Fodor, 2018). As maintained by Tundjungsari (2018), students lacked the motivation to learn independently and complete the game's stages. To improve the programme, students requested adding more game components such as exabis and customized certificates.

As specified by Irwanto`s (2023) study on research preferences and the use of gamification in higher education performed in Indonesia, the number of written works fluctuated during the year. Figure 1 demonstrates how gamification implementation research appears to have started in 2013, with Nahl and James' (2013) publication serving as the first manuscript ever acknowledged in that year. They looked at how gamification tactics may help online university students improve their critical thinking and motivation.

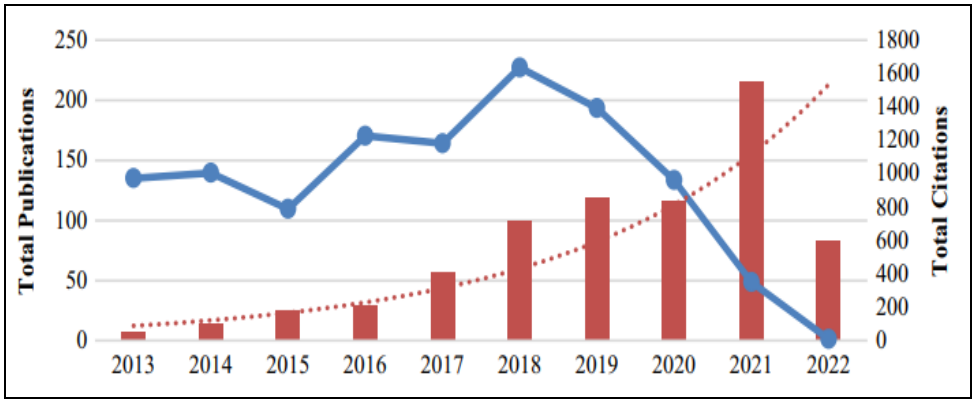

Figure 1: Evolution of Publication and Citation on Gamification in Higher Educations between 2013 and 2022

Source: (Irwanto, 2023)

Figure 1 lists papers on the use of gamification in higher education that were published after 2013. There has been a continuous increase since then. The literature on the adoption of gamification in higher education began gradually from 2013 to 2017, but gained traction in the following years. By 2021, the number of published publications has nearly quadrupled when compared to 2017. The trend line analysis of citation counts suggests that gamification is gaining traction.

Between 2018 and 2022, 685 works were published, accounting for 83.64% of all publications, with 2021 being the highest amount of publications to date (representing 26.37% of total volume). Since academics have been essential in popularizing the use of gamification, the number of research evidence in this sector has gradually increased. Because the review's data collection ended in April 2022, just 84 publications (0.09%) were published in 2022. The data was collected in the first quarter of 2022; thus, it is expected that scientific contributions would expand during the year and the following one.

In order to increase intrinsic incentives in a particular process, gamification methodically provides rewards that inspire extrinsic motivations (Wiggins, 2016). Gamification in education tries to develop students' intrinsic drive and support their dedication. Pursuant to Khaleel et al. (2018), gamification fosters a joyful and enjoyable learning environment. The study sought to determine the most widely utilized gamification elements and their effect on education as well as evaluating the influence of gamification on teaching and learning in higher education. The study also examined the theoretical underpinnings of gamification in the context of higher education as well as an investigation of gamification models used in education.

2 Methods and materials

The primary purpose of this research is to comprehend the effect of gamification in learning management systems (LMSs). From 2013 through 2022, scholarly papers were retrieved utilizing the research database. Bibliometric analysis criteria were used to provide a comprehensive review of the literature on the impact of gamification in higher education.

Bibliometric analysis technique, as claimed by McBurney and Novak (2002), may be used to statistically assess an academic area's publication physiognomies and research trends. As a result, bibliometric analysis gives organized data that summarizes quantitative articles and helps academics uncover research trends and patterns in a certain field of study.

When utilizing the advanced search tool, the search string includes a combination of compound phrases connected together with the logical operators AND Mss OR. The procedure is as follows: KEYWORDS: "gamif*" AND "higher education" OR "universit*" The asterisk (*) symbol allowed you to search for any combination of characters; for example, gamif* would discover terms like gamification, gamified, gamifying among others. The parameters examined were total publications, year of publication, and referenced papers. Following that, the frequency of each variable was calculated using dimension analytical techniques. In order to map trends in this subject, the indices were objectively investigated.

The research questions were addressed by carefully reviewing the final papers for pertinent information. Examining the data was also part of the analytical process. The study was carried out using bibliometric software, which extracted data from the Dimension Research database in comma-separated values (file.csv) format. This search was done in March, 2023. Descriptive statistics were used to examine the data, while frequencies and percentages were utilized to assess the outcomes. Graphs were used to display quantitative data such as yearly publication growth and citation growth. Microsoft Excel was also used to make tables and graphs.

3 Review of literature

The literature that was used in fulfilling the objectives of this study was reviewed thematically. These themes were theories of gamification and the impact of gamification on students' learning outcomes as well as the analysis of gamification models in higher education. The total number of articles that were reviewed was 30. However, out of all

these 30 articles, only 23 which met the threshold and as such they were included in the development of this study.

3.1 Theories of gamification in higher education

Despite the growing scientific interest in determining how gamification promotes positive emotion and drive, behavioural transformation, and learning, Jeanine et al. (2021) established that there is still a lack of an outline of the current theoretical perception of gamification's psychological workings. The theoretical underpinning of the gamification area has been interrupted. However, using a variety of ideas, experts in the area have clarified and grasped the notion of gamification in higher education. Table 1 summarizes the top 12 theories of gamification employed in higher education.

Table 1: Top 12 Theories Used for Gamification in Higher Education

Theoretical Foundation	Sum of Studies Using Theory	Sum of Studies in %
Self-Determination Theory	82	25.0%
Flow Theory	47	14.3%
Experiential Learning Theory	40	12.2%
Constructivist Learning Theory	31	9.5%
Situated Learning Theory	29	8.8%
Cognitive Load Theory	24	7.3%
Social–Cultural Theory of Cognitive Development	23	7.0%
Social Cognitive Theory	16	4.9%
Technology Acceptance Model	13	4.0%
Theory of Planned behaviour	10	3.0%
Reinforcement Theory	09	2.7%
Trans-theoretical Model of Behavioural Change (TTM)	04	1.2%

Notwithstanding the growing scientific interest in investigating how gamification promotes positive emotions, motivation, behavioural change, and learning, Jeanine et al. (2021) have demonstrated that there is a lack of a comprehensive framework for the current theoretical understanding of gamification's psychological mechanisms. The theoretical underpinnings of the gamification area have been lacking. Nonetheless, specialists in the field have elaborated and comprehended the notion of gamification in higher education by employing a range of approaches. *Table 1* lists the top 12 theories in the field of gamification.

Despite the increasing use of theoretical foundations in research, understanding the factors that contribute to effective gamification is more crucial (Sailer & Homner, 2020). Inadequate understanding of the psychological mechanisms by which gamification, serious games, and game-based learning produce their effects impedes the selection of

appropriate gamification structures, mechanics, and principles to achieve the desired results (Koivisto & Hamari, 2019; Sailer & Homner, 2020).

More research is needed to understand how gamification, serious games, and game-based learning might be fostered in different contexts (Sailer & Homner, 2020). Drive theories study the ways and features that produce drive, such as the three psychological criteria outlined by self-determination theory - autonomy, competence, and relatedness (Ryan & Deci, 2020).

Gamification and serious games can also help people feel more confident in coping with emergencies (Chittaro & Buttussi, 2018), spotting online security concerns (Baral & Arachchilage, 2019), and completing educational activities (Blasko-Drabik et al., 2013). Being in a state of flow, according to the flow theory, entails a "holistic feeling that people experience when they are fully engaged" (Csikszentmihalyi, 1975). When people are thoroughly immersed in an activity, they experience it as intrinsically fulfilling and pursue it for the sake of the action rather than the final aim (Csikszentmihalyi, 2014). The influence of gamification and serious games on flow experiences, however, has not been demonstrated decisively (Almeida & Buzady, 2019; Bitrián et al., 2020; Catalán et al., 2019; Chung et al., 2019).

Self-Determination Theory (SDT), which holds that self-governance, competency, and connection create inner drive, is the cornerstone for effective gamification (Ryan & Deci, 2020). Self-governance is related with the ability to make decisions, whereas competence is associated with studying the educational material in order to urge users to participate in course activities more intensely. In contrast, association is focused with social interaction and participant relationships. In the opinion of Ryan and Deci (2020), motivation is a theoretical concept within the SDT that explains the impulse, direction, persistence, and quality of behaviour, ultimately contributing to improved performance, perseverance, creativity, and vitality.

Table 1 previously demonstrated that the majority of gamification research in higher education employ self-determination theory. This is seen in Figure 2, which shows how its use has increased since 2014.

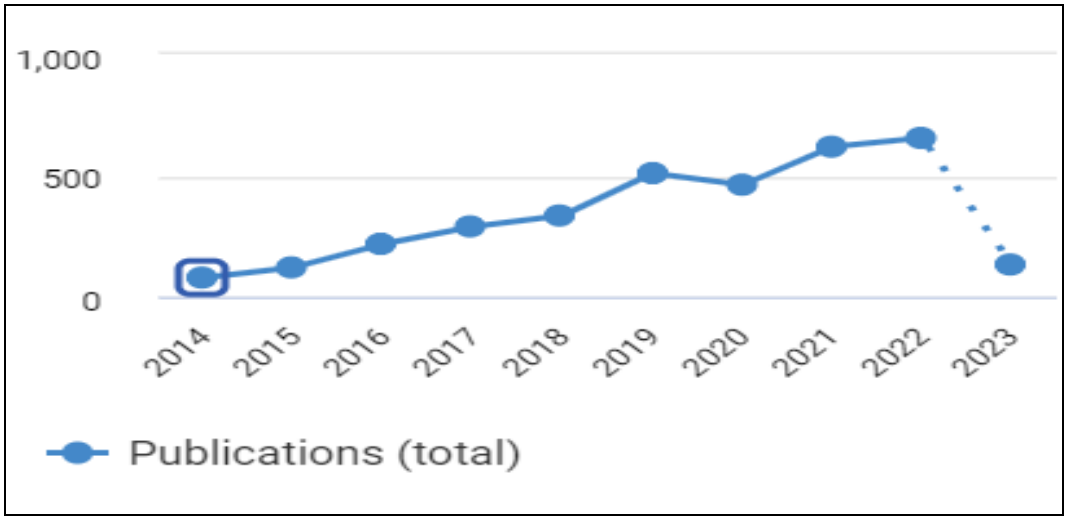

Figure 2: Theoretical Foundation of Gamification Usage in Higher Education

The data presented in Figure 2 reveals a significant increase in the utilization of self-determination theory when integrating game-like components into higher education, spanning from 2014 until the present day. This clearly exhibits that SDT holds greater importance in the gamification of higher education compared to other theories, as noted by Jeanine et al. (2021).

3.2 Gamification elements and their impact on students' learning outcomes

Gamification tools may be efficiently utilized in a variety of academic settings. The clear distribution of results provides an instant feedback system, which may be extremely beneficial for learners to quickly measure their progress inside the module and throughout the course (Neble et al., 2016). Offering points for participation in exams and activities, as well as demonstrating satisfaction and dedication, may be a powerful motivator for learning.

Leader boards are a well-known gamified learning feature that, when used in the correct learning environment, may be quite effective (Nebel et al., 2016). As they interact with the learning content, students get rankings based on their grades, peer evaluations, or speed. These rankings are subsequently shown on the learning platform's public scoreboard, emphasizing students' ranks and accomplishments. In a study of game components in education, Dichev and Dicheva (2017) discovered evidence that gamification can promote productivity, enable lifelong learning, and improve memory. Alsawaier et al. (2018) investigated the usage of gamification in higher education and reported that popular game components included avatars, quests and challenges, badges,

points, and levels, all of which can inspire students to participate in their work to boost motivation, and develop positive learning habits.

In their comprehensive evaluation of gamification in enhanced higher education, Bozkurt, and Durak (2018) analysed the most well-known research approaches and theoretical frameworks. They observed that almost all studies that integrated gaming features and gamification enhanced scholar interest and participation. In their academic review, Subhash and Cudney (2018) explored the subject of gamification in higher education. They observed that gamification designs featured numerous entertainment components, and that gamification boosted student engagement, self-assurance, motivation, and performance.

Albertazzi et al. (2019) provided an overview of gamification research done between 2012 and 2017 across many disciplines. According to the study, gamification enhanced students' interest and motivation. In their respective investigations, Alsawaier (2018), Buckley et al. (2019), and Dichev and Dicheva (2017) found that gamification had a negative impact. These studies found that further empirical study and testing are required to fully comprehend the potentials and repercussions of gamification on student motivation.

The most popular game components in higher education gamification designs, as determined by Subhash and Cudney (2018), were badges, leader boards, and points. Gamified courses, they added, utilised levels, assignments, objectives, and rapid feedback. The addition of points, badges, leader boards, or other game components to a gamification approach does not ensure its success. Landers (2014) recommends doing study to investigate and analyse whether appropriate combinations of game elements affected motivation and learning.

Despite the fact that the majority of gamification designs incorporated 5 to 9 gamification elements, De Armas de Armas et al. (2019) suggests that a gamified teaching and learning platform should not have too many components because this may distract students. Learning management systems must be meticulously planned and built. Students may lose interest in using them if they are poorly designed, ineffective, or employ inappropriate gamification strategies (Dicheva et al., 2015).

3.3 Impact of integration of gamification in higher education

On the authority of Muhammad et al. (2021)'s research in Indonesia, gamification has resulted in a considerable increase in students' engagement, intrinsic motivation, extrinsic

motivation, interest, enjoyment, satisfaction, and inventiveness in learning activities. Furthermore, as demonstrated by Sailer et al. (2017), gamification has the ability to increase human motivation and performance in particular learning activities. In consonance with Vidakis et al. (2020), if teaching tactics are not communicative, students lose interest and become disconnected from course contents. This lack of interest may have a negative impact on students' academic achievement by preventing them from actively participating in their education.

Dimitar et al. (2020) reviewed gamification platforms for higher education in Greece, acknowledging the importance of motivation in higher education and recommending the use of gamification components to engage students in the learning process and give meaningful learning experiences. Elvira et al. (2022) conducted a study on the efficacy of gamification as a teaching approach at COVID-19 in Mexico and discovered that it promotes participation and motivation among undergraduate students. However, incorporating gamification into LMSs has not been shown to increase students' success in their course areas, which contradicts the findings of other academics. This inconsistent data suggests that opinions on the usefulness of utilizing gamification strategies in higher education are diverse, underlining the need for more study in this sector to bridge the knowledge gap.

Ingrid and Marc (2021) performed an Australian study that recommends that further research is needed to evaluate the benefits of gamification in important areas of learning, such as student participation, information retention, attention, reinforcement, and enhanced assessment outcomes in higher education settings. It would also be advantageous to evaluate existing programs with gamified aspects in order to assess changes in student involvement, learning, pleasure, preservation, and success. More research on the use of gamification in education might provide helpful outcomes. The researcher is also of similar opinion that more studies are required in gamification to determine its effect on students' academic performance in higher education.

As specified by Georgi and Daniela's (2021) research on gamification implementation in higher education, specifically in a pilot study on SQL courses, incorporating gamified self-learning in SQL courses can lead to better academic outcomes for students, regardless of the frequency or quantity of gamified self-learning sessions completed. The authors want to provide a useful framework for university professors to encourage students to participate in online activities throughout their learning journey.

In the light of a study conducted in Slovakia by Palová and Vejaka (2022) on the incorporation of gamification principles in higher education, it is critical to analyse the behaviours, inclinations, preferences, and learning requirements of digital natives who are new entrants in universities in order to customize their education. Furthermore, in order to achieve the desired beneficial effects, the study suggests that professors and instructors include gamification approaches into the instructional procedures of their courses. It would be useful to validate the findings in different nations and academic fields. This study has the potential to be expanded, and other statistical approaches, such as the paired-samples t-test used in inferential statistics, might be utilized to confirm the impact of gamification on the educational process. This confirms whether there were any significant differences between learners who used a gamified LMS and those who did not. This calls for an experimental research.

In order to have an influence on students' learning, Maria et al.'s (2020) research on gamification in higher education in Portugal argues that it must be creative and founded on scientific principles in both its design and implementation. Furthermore, it is verifiable that the use of gamification in subsequent teaching and learning processes helped students attain academic success by improving and enhancing their technical and behavioural talents.

Another study done in Brazil on the systematic mapping of gamification in higher education by Leandro et al. (2021) confirms the conclusions that gamification designs have a positive influence on motivation, engagement, and learning. Gamification also provides students with constant feedback and stimulates classroom engagement, interest, and attendance. The following most often utilized game characteristics in the articles that were picked were levels, incentives, feedback, and challenges.

More study, as maintained by Alsawaier (2018), is needed to properly understand how gamification influences students' engagement, attentiveness, and motivation during their learning processes. There is presently insufficient research to support the idea that gamification increases student motivation and participation in higher education. To investigate the results, it would be necessary to develop gamification via a lengthier experiment across a variety of areas and courses (Agapito & Rodrigo, 2018; Loos & Crosby, 2017).

In Hungary, István et al. (2017) uncovered multiple articles by foreign writers in several scientific databases while working on a study on the application of gamification in higher

education. This was surprising given the scarcity of literature on gamification. In regards with the study's findings, students studying IT and non-IT interpret gamification differently. According to the study's findings, even when gamification was applied, students in some IT classes did not find the lectures engaging.

Melissa et al. (2021) did a study on social robots and gamification for technology-supported learning in Germany: According to an empirical research on motivation and engagement, a social robot, gamification components, or both, can improve the learning experience. An intriguing relationship between the additions was discovered, demonstrating that the inclusion of a social robot and gamification components might reduce engagement. Furthermore, Melissa et al.'s 2021 findings provide useful information for the study of social robotics, gamification, and technology-enhanced learning, and they recommend additional research into the impacts of social robots, gamification, and interaction.

According to a research on gamification and active learning in higher education conducted by Luis et al. (2021) in Bologna, is it feasible to fulfil the interests of students, academia, and the digital society? Gamification has been shown to encourage the development of skills required by the modern workplace in the context of the described active learning framework. The scores and levels of satisfaction of the gamified and non-gamified student groups, on the other hand, did not differ substantially.

Furthermore, there is no clear definition in the literature on the fundamental concept of gamification of the game design features that should be employed to generate a successful gamified experience (Landers et al., 2018). The most common gamification components in higher education are points, badges, and league tables (Alomari et al., 2019; Subhash & Cudney, 2018). This strategy avoids "pontification," which refers to the usage of just points, badges, and league tables and might lose effectiveness as the novelty effect wears off (Huang et al., 2020; Tsay et al., 2020).

The underlying notion of gamification, as well as the game design features that should be used to create a successful gamified experience, are not clearly defined in the literature (Landers et al., 2018). Badges, points, and league tables are the most often utilized gamification features in higher education (Alomari et al., 2019; Subhash & Cudney, 2018). Using solely points, badges, and league tables is known as "pontification," and it can lead a strategy to lose efficacy when the novelty impact has worn off (Huang et al., 2020; Tsay et al., 2020). This approach circumvents this.

Gamification is frequently employed in a variety of higher education learning sectors. In terms of consumption, education today ranks second only to information and computer sciences. This was proved by bibliometric analysis. Figure 3 depicts several gamification applications.

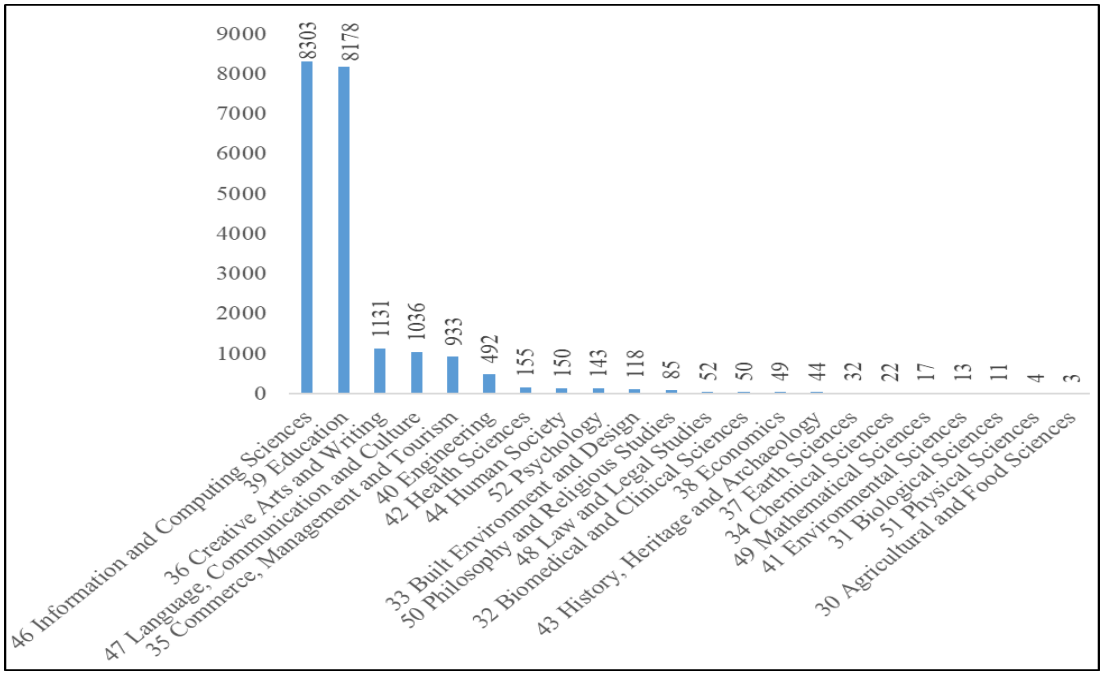

Figure 3: Fields of Research
Source: (ANZSRC, 2022)

4 Analysis of gamification models in higher education

In Kenya, Kamunya et al. (2019) investigated a gamification paradigm for eLearning systems. They discovered that existing gamification design frameworks for eLearning platforms are limited, with only one design framework established and evaluated. This is due to the lack of a theoretical model for design and assessment, as recommended by the study.

To increase motivation, attention, and engagement, Rincon-Flores, and Santos-Guevara (2021) presented a gamification framework that incorporates components such as awards, badges, avatars, and a leadership board. The mechanics of rewards are founded on the superhero narrative, which portrays information, attitudes, and beliefs as individual abilities.

Figure 4 shows the number of gamification models developed across disciplines. Information and computing sciences are clearly at the forefront of educational practices. This suggests that more study is needed to develop the integration of gamification methodologies in higher education LMS.

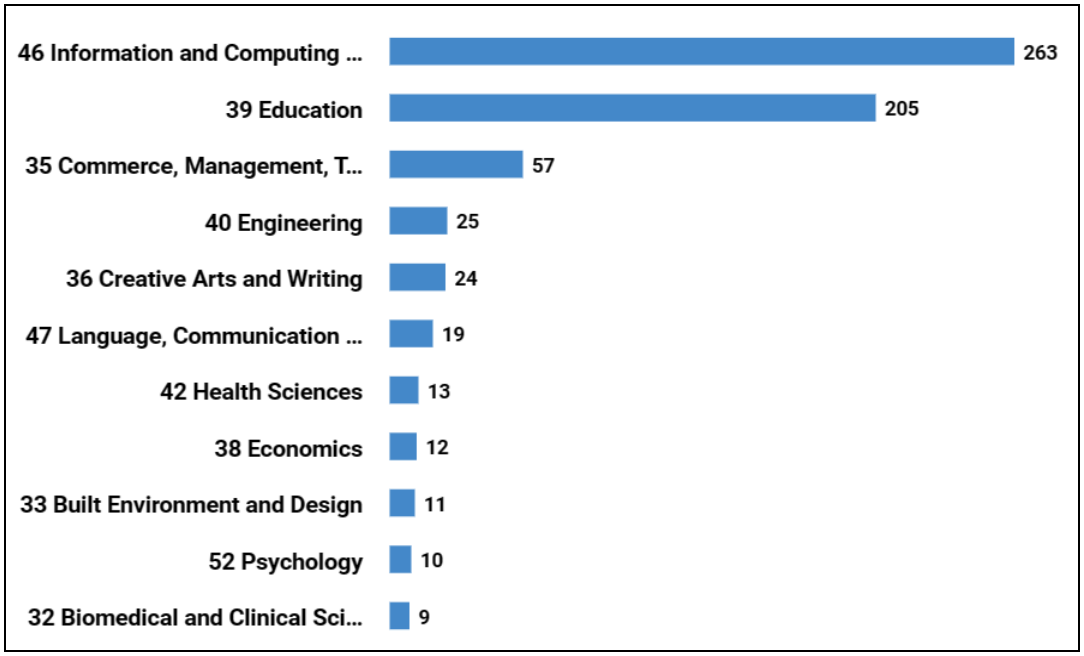

Figure 2: Fields of Research
Source: (ANZSRC, 2022)

Any gamification solution must be validated by technical and psychological professionals. As demonstrated by Zichermann and Cunningham (2011), gamification is mostly focused on psychology (75% of the time) and technology (25% of the time). The validation procedure should verify that game features can be smoothly incorporated into an LMS such as Moodle.

In Montenegro, Nadja et al. (2017) assessed the use of gamification in eLearning for higher education while allowing for different learning styles. According to the findings, a further in-depth evaluation of the value of gamification across diverse academic areas and learning preferences is required. Future study will concentrate on applying and evaluating the proposed model with a larger sample size in order to discover correlations and variables between different learning styles and student behaviour in gamified online learning settings.

5 Conclusion and directions for future studies

The purpose of this research was to identify the commonly utilized gamification elements and the impact of gamification on students' academic performance as well as to examine gamification models employed in pedagogy. Furthermore, the study investigated the theoretical underpinnings of gamification in education using a narrative literature analysis in order to find patterns and ramifications of implementing gamification in higher education.

According to the analysis, gamification in education heavily incorporates the self-determination theory, this theory was found to be omnipresent in the majority of gamification studies. Additionally, the study found that experience points, badges, level ups, and leader boards are the most frequently used game elements in education sector. Most of the examined research generally supported the idea that gamification improves students' academic performance. It has been demonstrated that integration of gamification elements in LMSs significantly affect student engagement, driving intrinsic and extrinsic motivation, interest, enjoyment, satisfaction and creativity in learning activities. However, some research indicates that gamification may be damaging to students' learning outcomes. This means that there is a conviction in the effect of gamification on students' academic performance hence confirming a lacuna in this arena worthy to be filled.

Only peer-reviewed articles about gamification in higher education that were released after 2013 were included in this analysis. It was restricted to bibliometric techniques. The findings of this study are significant for decision-makers, practitioners and critical thinkers in the field of eLearning education. The paper recommends that more investigation into gamification and other game elements be carried out at various academic institutions. It also suggests that future research should construct and display bibliometric networks utilizing the Dimensions research database and VOS viewer.

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