



Educational dualism in action: Systematic review of gamification and flipped classrooms' effects on young learners

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ABSTRACT

The systematic review explores the integration of gamification with the flipped classroom in basic education, combining game mechanics with flipped teaching methods to improve student engagement and motivation, and examines the evolution of scientific production between 2022 and 2024, using the preferred reporting items for systematic reviews and meta-analyses approach to select 37 articles from Scopus and Web of Science. The search focused on terms such as "gamification" and "flipped classroom", and a bibliometric analysis was applied to assess research trends and methods. The results indicate that gamification in flipped classrooms increases motivation, autonomy and content retention, in addition to improving satisfaction and academic performance, revealing a student preference for gamified environments that facilitate interactive and autonomous learning; on the other hand, the ATLAS.ti software qualitatively revealed key issues through a cross analysis of the perceptions of the various authors, concluding that this integration is effective in increasing student motivation and satisfaction, recommending its application to teach in multidisciplinary environments.

Keywords: gamification, flipped classroom, education, academic motivation

INTRODUCTION

Gamification in the flipped classroom has evolved significantly in recent decades, adapting to technological advances and changing pedagogical needs in the basic educational environment.

In its early uses, gamification focused on incorporating basic game elements, such as points and rewards, to motivate learners; however, over time, this methodology has evolved into more complex and personalized approaches, now considering playful elements and the associated rewards to transform learning into a more engaging and fun experience (Aidoo et al., 2022; Holguin-Alvarez et al., 2022). By integrating game mechanics, such as points, badges, and levels, students may feel more incentivized to actively participate and overcome academic challenges (Huesca et al., 2023; Kazu & Kuvvetli, 2023).

Educational Dualism Under Study

Cevikbas and Kaiser (2022) highlight how this model changes the traditional teaching dynamics, allowing students to access content at home and use classroom time for hands-on activities and problem solving. Du et al. (2023) in their concept of the flipped classroom, mention that it focuses on preparing students for in-class activities through the use of prior materials that may include videos, readings or interactive exercises.

Gamification, on the other hand, refers to the use of game elements in non-game contexts to motivate and engage students (Huesca et al., 2023); on the other hand, Baah et al. (2023) highlights how gamification can be a powerful motivator for students, increasing their interest and engagement in learning. Similarly, Chen et al. (2023) and Cheng et al. (2022) evaluate the use of gamified platforms to improve student motivation and encourage desirable behaviors such as recycling among young people.

Firdousi et al. (2024) highlight that the combination of innovative methodologies can improve student satisfaction and academic performance in diverse educational settings, including physical, hybrid and online classrooms. This methodological duality not only responds to student expectations, but also aligns with the need to personalize the educational process (Anane, 2022; Ma et al., 2024).

Recently, it has been highlighted how gamification in the flipped classroom has begun to incorporate emerging technologies such as augmented reality, which offers immersive and personalized learning experiences (Al-Said et al., 2023). Firdousi et al. (2024) mention that technology allows students to access educational resources outside the classroom and that contributes to the development of self-regulated learning.

Purpose of the Review

The objective of this systematic review is to comprehensively and critically evaluate the literature on the integration of gamification in the flipped classroom at the basic education levels, having as a research question: What are the effects of the application of this educational dualism in the learning of basic education students according to the literature review? The specific objectives are: How has the scientific production on gamification in the inverted classroom evolved from 2022 to 2024, what is the annual trend of the most influential articles and databases in this field, what are the similarity themes addressed by the different authors, and what is the comparison between research journals in terms of the different approaches, scopes and methodological tools applied?

METHODOLOGY

Meta-analysis is used to consolidate studies on gamification in the inverted classroom in basic education, following the methodological approach of Briner and Denyer (2012). Data collection included exhaustive searches in Scopus, Web of Science (WoS), in addition to other search engines. In Scopus, terms such as "gamification", "inverted classroom" and "flipped classroom" combined with Boolean connectors "AND" and "OR" were used, generating 119 initial articles. In WoS, similar terms such as "gamification" and "basic education" were used, resulting in 222 articles; with respect to search engines such as websites, repositories and Google academic, no relevant information on the topic was found, with a final result of 37 articles.

The preferred reporting items for systematic reviews and meta-analyses (PRISMA) model shown began with the identification of 341 records in the Scopus (119) and WoS (222) databases. Subsequently, 118 duplicate records were eliminated, and 33 more were discarded by automated tools and other criteria. After screening 180 records, 112 reports were selected for detailed evaluation, of which 76 were assessed for eligibility. Finally, 37 studies were included in the final analysis, after excluding those that did not meet the criteria of study population, study orientation or IMRD structure (introduction, methodology, results and discussion, and conclusions). In addition, additional studies were identified through websites and repositories, but although only some were retrieved and evaluated after exhaustive and rigorous screening, none were considered (**Figure 1**).

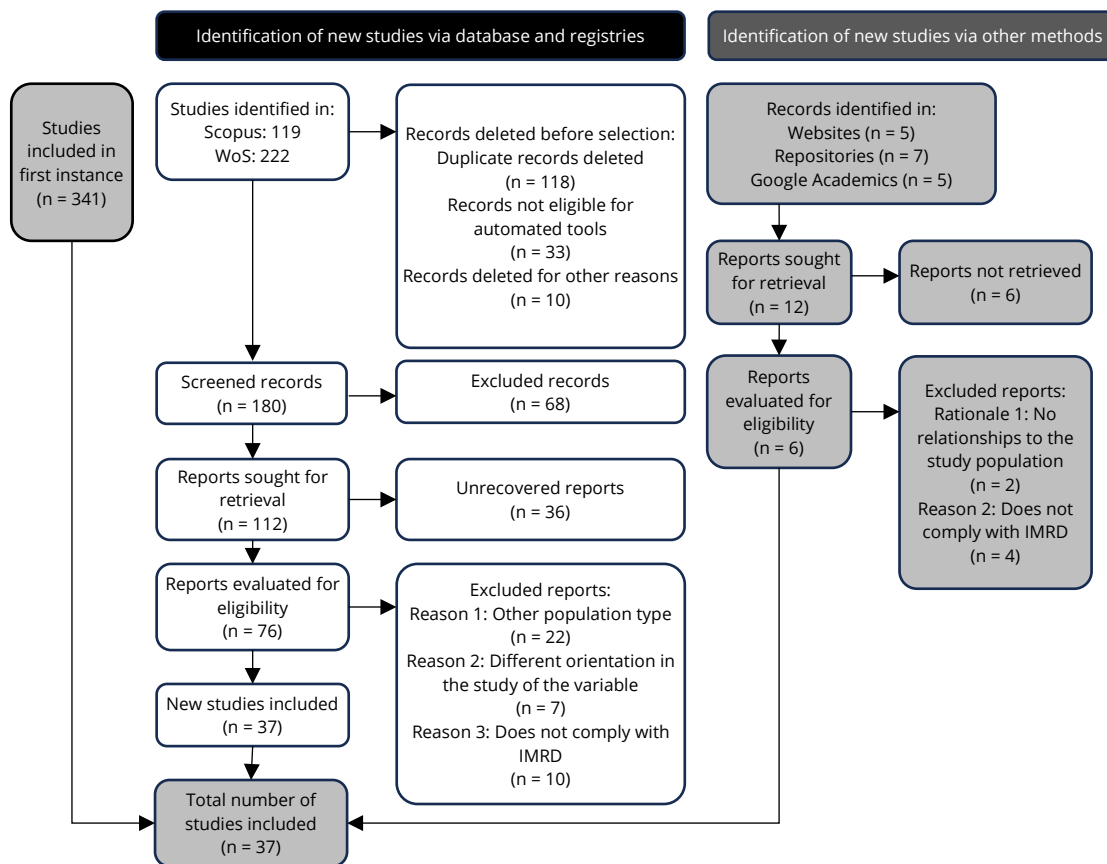


Figure 1. PRISMA flowchart–Version 2020 (Source: Authors' own elaboration)

RESULTS

The following is a presentation of the various effects of gamification on the learning of basic education students when it is incorporated in the inverted classroom, with the following results duly documented by several researchers in the academic literature.

Academic Motivation

The integration of gaming elements in the flipped classroom has significantly increased student motivation due to the interactive and immersive nature of gamified activities (Joy et al., 2023; Ma et al., 2024), which make students feel more engaged with the content and more willing to actively participate in the learning process (Firdousi et al., 2024).

In the study conducted by Chen et al. (2023), high school students who participated in the gamified flipped classroom experiment showed a predisposition to learn academic content by decreasing anxiety scores and increasing fluency and collaborative resolution scores by spending more time practicing in a remote education environment, as well as overcoming challenges in game-based learning processes and accumulating merits that can be translated into more effective and sustained learning.

Cevikbas and Kaiser (2022) argue that the implementation of new ideas such as the flipped classroom often stems from circumstances in which an innovative approach is inevitable, especially in an online learning environment, highlighting the benefits of a more engaging pedagogy that is especially effective in teaching mathematics. They point out that it brings student metacognition and that it can increase intrinsic motivation by being faced with a challenging environment, leading to better academic results in times of pandemic.

On the other hand, it highlights the comment of Cheng et al. (2022) stating that high school students who participated in a gamified inverted classroom managed to achieve high standards of autonomous motivation, having a greater effect compared to controlled motivation, since the excitement, challenge, and fun they experienced allowed them to moderate their interest and academic identity. Similarly, Kaya and Ercag (2023)

demonstrated that a gamification program that is also challenge-based can significantly improve students' motivation and academic performance by creating competitive and disruptive environments, indicating that student engagement can generate a significant effect from a flipped classroom environment.

Autonomy in Learning

Autonomy in learning is an additional effect provided by gamification in the flipped classroom given that students play the role of involved and permanently active agents of their own learning and its eminent effect is reflected in self-regulation and self-management skills that strengthen their long-term academic success (Alhalafawy & Tawfiq Zaki, 2022; Carrion et al., 2022). In a context where it is necessary to train students capable of questioning and challenging the tasks they exercise at their own pace, gamification in the flipped classroom is the main player in fostering self-discipline and the ability to organize their time and efforts more effectively (Chen et al., 2023; Han, 2022).

Baah et al. (2023) mention that by using gamification through external motivators within a classroom, feelings of competence and autonomy are developed, defending the theory of self-determination based on the fact that students find attractive the contents with which they can interact and find compelling and interesting, generating attributes of attention, relevance and self-confidence, indispensable requirements for a favorable behavioral change.

Likewise, Durrani et al. (2022) argues that for a favorable behavioral change, gamified assessments in an inverted classroom will allow students to generate self-determination and take responsibility for the results generated in their own learning, creating positive effects on their levels of motivation and autonomy. Du et al. (2023) supports the idea that in a flipped classroom environment students themselves are encouraged to take ownership of their self-regulated learning by considering direct and indirect recommendations that help improve their skills. This important acquired autonomy grants the possibility that students can construct objectives and goals that are not only academic, creating a greater degree of independence that bets on submitting to a more personalized learning experience.

Thus, Ng and Lo (2022) determine that educational dualism by seeking a different, independent and personalized learning experience will stimulate other types of inherent elements, such as the intrinsic motivation of students to excel, learn and develop, encouraging them to pursue knowledge beyond the classroom environment. Likewise, Holguín-Alvarez et al. (2022) point out that students subjected to flipped classroom practices showed a greater willingness to explore and understand concepts by themselves, which marks an important result in the quality of learning. Thus, this sense of autonomy, anchored to the supportive structure of gamified learning, creates an environment in which students can thrive academically.

Content Retention

It is clearly evident how the learning structure is transformed by implementing innovative actions such as synchronized work between gamification and good practices of inverted classroom because it allows students to develop other types of metacognitive skills such as information retention in an effective, creative and captivating way, moving them to be easily replicated in practical situations (Alkhalaf, 2023), this because gamified activities are positioned as memorable and are thoroughly designed to actively involve students in the learning process (Cheng et al., 2022).

According to Corrales' (2023) study, students who mainly participate in gamified mathematical activities within an inverted classroom are statistically evidenced to show a significant improvement in the retention of mathematical concepts, and they are also able to transfer this knowledge to other new scenarios that require the solution of mathematical logic problems, which shows that gamification facilitates the transfer of knowledge.

Academic Satisfaction

Da Silva et al. (2022) highlights that gamification, when integrated with flipped learning, improves academic satisfaction among high school students by providing a more interactive and motivating approach; likewise Suire et al. (2024) and Downie and Proulx (2022) note that, the flipped classroom with gamification elements not only facilitates knowledge acquisition, but also increases student satisfaction due to personalization and content relevance.

Acosta-Medina et al. (2021) and Izadpanah (2022) highlight that students prefer virtual learning environments that incorporate gamification, as this increases their engagement and satisfaction in learning in a playful and structured way. Huang et al. (2023) confirm that gamification in strategically designed learning activities promotes higher engagement and satisfaction, leading to more effective learning.

Academic Performance

It has been shown that students who participate in a gamified learning environment tend to earn higher grades and develop a deeper understanding of concepts (Antonelli et al., 2023; Baah et al., 2023; Durrani et al. 2022). This increase in performance is due, in part, to the motivational nature of gamification, as well as the structure of the activities, which often require students to demonstrate their understanding in tangible ways (Eusof et al., 2022).

For example, Kaya and Ercag (2023) prove that the implementation of a challenge-based gamification program not only improves academic performance, but they also experienced an increase in their intrinsic motivation and a state of flow during learning activities.

In contrast, Huesca et al. (2023) focus on a specific discipline—programming—and their findings indicate that gamification leads to improved problem-solving skills and programming proficiency. While Kaya and Ercag (2023) discuss general academic performance, Huesca et al. (2023) narrow their examination to specific skill sets, illustrating that gamified approaches can have tailored benefits in particular subject areas.

Similarly, Izadpanah (2022) examined the impact of flipped teaching in EFL contexts and found that gamified environments resulted in higher levels of academic resilience and performance. While Kaya and Ercag (2023) emphasize motivation and flow, Izadpanah (2022) brings attention to the role of resilience, suggesting that gamification not only fosters engagement but also equips students to face academic challenges more effectively.

Bibliometric Analysis of the Scientific Literature

According to the evolution of scientific literature on the subject under study in relation to the continent, database and year, the following is an analysis of 37, with Scopus being the most used database, representing 81% (30/37) of the cases, while WoS covers 19% (7/37). In terms of geographical distribution, North America is the most represented region, with 24.3% of the articles, followed by Europe with 21.6% and Asia with 21.6%. South America contributes 13.5% and Africa and Oceania each contribute 10.8% and 8.1%, respectively.

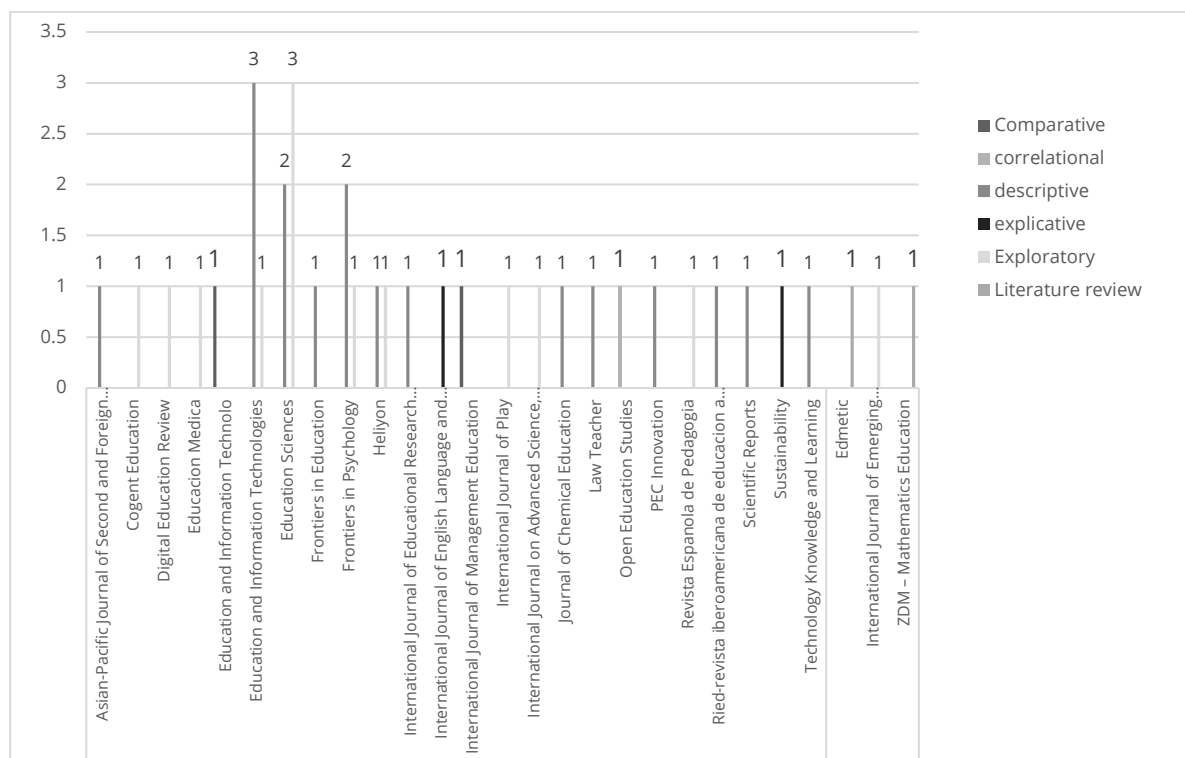
Table 1 shows the distribution of 37 articles by country, year and database between 2022 and 2024, with a clear predominance of Scopus, which contributes 31 articles, while WoS contributes 6. In the first instance, the United States leads the academic production with 5 articles, distributed between both databases, followed by Brazil and Mexico with 3 articles each, standing out in Scopus; likewise, other countries such as Australia, India, Italy and Japan present a greater diversity, with articles in both Scopus and WoS, reflecting a more balanced strategy in the use of these platforms. On the other hand, countries such as Argentina, Canada, Colombia, Chile, and France have articles exclusively in Scopus, while Germany and Sweden stand out for their publications only in WoS in 2023.

In general terms, Scopus continues to be the dominant database, covering a larger number of publications in almost all countries, while WoS maintains a more discrete, although significant, presence in certain years and countries. In terms of years, 2022 has the highest representation with 38%, followed by 2023 with 38% and 2024 with 24%. The high representation of articles in Scopus shows its predominance in research, especially in 2022 and 2023.

The analysis of 37 articles reveals a dominant quantitative methodological approach (91.9%), with 8.1% of mixed studies, the most common scopes being descriptive (35.1%) and exploratory (32.4%), reflecting a strong orientation towards the description and exploration of educational phenomena. On the other hand, questionnaires are the most used instrument (37.8%), followed by observation sheets (24.3%) and checklists (16.2%). The journals *Education and Information Technologies* and *Education Sciences* stand out, each with 5 publications, followed by *Frontiers in Psychology* with 3, with most of the studies being areas that focus on education, technology and social sciences, according to **Figure 2**.

Table 1. Distribution by year, country, and database

Country	Database	Scopus	Year			Total
			2022	2023	2024	
Argentina	Database	Scopus		1		1
Australia	Database	Scopus		1		1
		WoS	1			1
	Total		1	1		2
Brazil	Database	Scopus	1	1		2
		WoS			1	1
	Total		1	1	1	3
Canada	Database	Scopus		1	1	2
Chile	Database	Scopus	1			1
China	Database	Scopus	1	1		2
Colombia	Database	Scopus		1		1
France	Database	Scopus	1			1
Germany	Database	WoS		1		1
India	Database	Scopus	0	1		1
		WoS	1	0		1
	Total		1	1		2
Italy	Database	Scopus	1	0		1
		WoS	0	1		1
	Total		1	1		2
Japan	Database	Scopus	1	1		2
Mexico	Database	Scopus	2		1	3
New Zealand	Database	Scopus	1			1
Philippines	Database	Scopus	1			1
South Africa	Database	Scopus		1	1	2
Spain	Database	Scopus		1	1	2
Sweden	Database	Scopus		1		1
United Kingdom	Database	Scopus	2			2
United States	Database	Scopus	2	1	1	4
		WoS	0	0	1	1
	Total		2	1	2	5
Total	Database	Scopus	14	12	5	31
		WoS	2	2	2	6
	Total		16	14	7	37

**Figure 2.** Distribution of the journal according to focus and methodological level (Source: Authors' own elaboration)

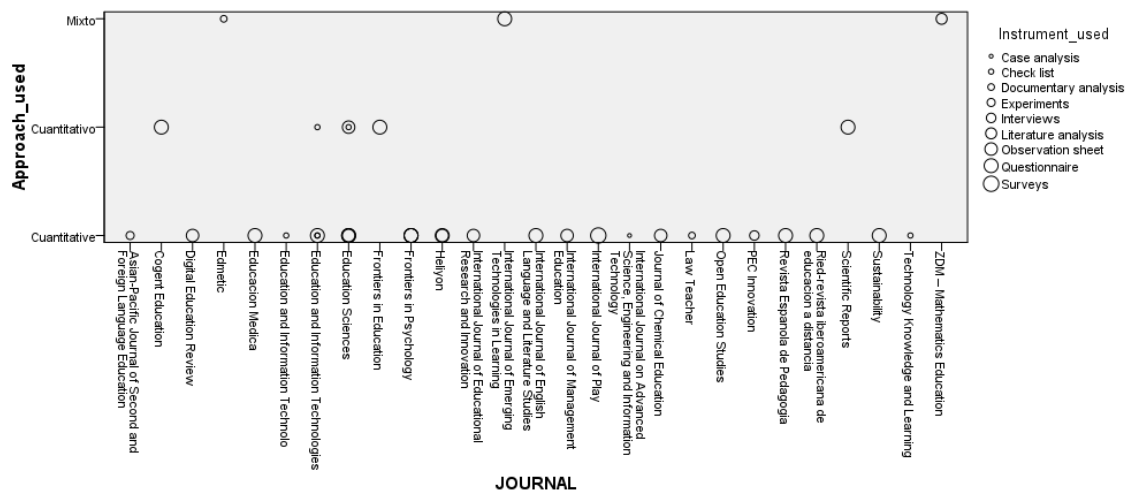


Figure 3. Distribution of approaches and instruments by journals obtained from SPSS software (Source: Authors' own elaboration)

Figure 3 analyses the methodological approaches and instruments used in articles published in various scientific journals. The vertical axis presents three approaches: quantitative, qualitative and mixed, while the horizontal axis lists the journals and each circle indicates an article, and its size reflects the frequency of the instruments used, which include surveys, interviews, case analyses, checklists, and more.

A predominance of the quantitative approach is observed in most publications, especially in journals such as “Sustainability” and “Scientific Reports,” which primarily use questionnaires. Mixed approaches are less common but stand out in journals such as “ZDM–Mathematics Education” where interviews and other combined methods are used; on the other hand, qualitative studies are less frequent, and their representation is limited in the graph.

This analysis reflects the preference for quantitative methods in academic research on the variables attributed to educational dualism in the present review and highlights how some mixed studies offer a richer combination of tools, especially in more interdisciplinary or educational disciplines.

On the other hand, the ATLAS.ti 9 software was used, whose procedure involved the loading of the 37 articles, for the subsequent creation of codes derived from recurrent concepts using a qualitative analysis to map the interrelationships between the identified themes, according to **Figure 4**. Thus, the most relevant themes obtained were academic performance with a mention of 164 times, representing 42.16% of the total; followed by student motivation with a mention of 77 times and student participation mentioned 42 times, with a significant percentage of 19.79% and 10.79%, respectively. Autonomous learning and academic satisfaction were also areas of interest, although to a lesser extent, representing about 7% each.

DISCUSSION

Acosta-Medina et al. (2021) and Khodabandeh (2022) highlighted that students' preference for the use of gamification in virtual environments indicates a growing need to adapt traditional methodologies to more interactive and engaging formats. On the other hand, it is stressed that gamification can be a catalyst for deeper learning as students become more actively involved in the educational process (Adams & Du Perez, 2022; Liu et al., 2024; Suire et al., 2024).

In other instances, Antonelli et al. (2023) demonstrates that the use of gamification in the flipped classroom not only improves the perceived efficiency of learning in a foreign language classroom, but also increases knowledge retention and the development of critical thinking skills. This finding is consistent with the study by Cevikbas and Kaiser (2022), who observed that flipped classroom pedagogy, when combined with gamification strategies, offers promising prospects for mathematics education, highlighting student flexibility and adaptability.

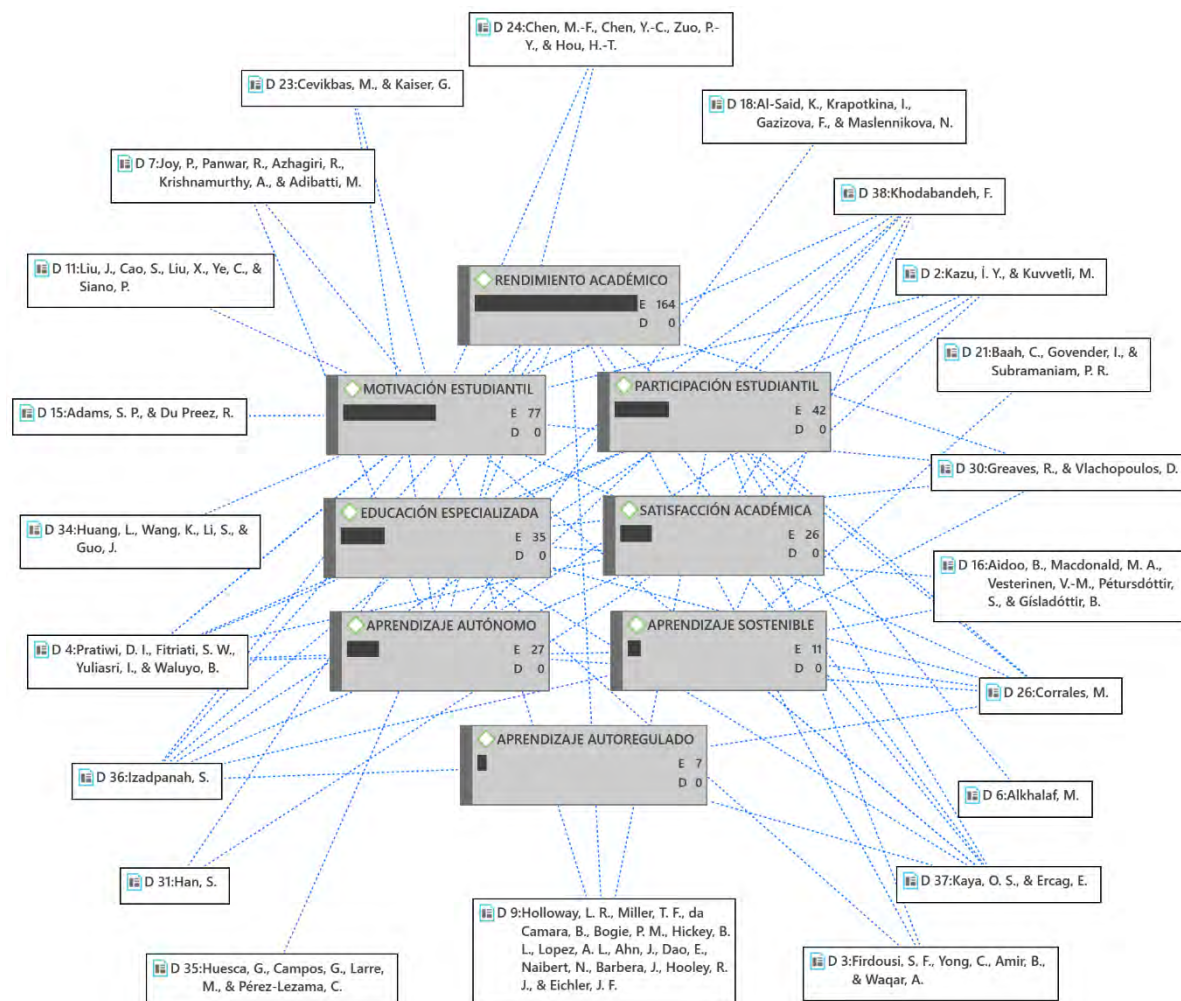


Figure 4. Recurring themes by authors obtained from Atlas.ti 9 software (Source: Authors' own elaboration)

In the study conducted by Holguín-Alvarez et al. (2022) on how the various mixed strategies have had a significant effect on the regulated learning of students in basic programming courses is striking, since in their findings they state that educational platforms and video games substantially improve conceptual understanding and the practical application of knowledge, having a direct impact on the creative ways of solving problems and on their own academic performance; Furthermore, the studies by Kaya and Ercag (2023) and Greaves and Vlachopoulos (2023) showed that a gamification program based on challenges causes students to activate self-determination skills and that their learning develops in a competitive and highly satisfying student participation environment, increasing their immersion and delight throughout the learning process.

Firdousi et al. (2024) argue that, by combining within the learning system, a specialized education will allow instruction that raises student satisfaction and expectations as each teacher's action is configured in favor of the various types of academic profiles; however, it is necessary to point out that these good practices are accompanied by adequate training and appropriate resources and tools, even more so in hybrid and remote environments, which, although they generate a certain pedagogical challenge, but it is where playful strategies that adapt to the unique needs of students should be addressed the most. This is consistent with Alkhalaf's (2023) research, which highlights that student participation is the starting point for better engagement in a flipped classroom context as it fosters self-confidence and free willingness to develop academic skills and make correct decisions in critical or peaceful environments in which solutions are sought.

On the contrary, Kaya and Ercag (2023) mention that educational dualism, which is the subject of study, provokes learning that connects elements such as quality, equity and inclusion, proving that the combination of disruptive strategies will allow students to experience challenging but achievable activities and by providing

them with autonomy to develop sustainable learning in which they can experience high commitment and academic satisfaction. For their part, Joy et al. (2023) give great relevance to gamification in times of pandemic, studying the perspectives of teachers and the needs of students to face teaching methods in virtual environments, highlighting that motivation must be managed through the impulse caused by an external factor but also by an internal one. The incorporation of interactive material elements is adequate, but self-motivation must start from the interest that pushes the student to explore, know and learn.

Liu et al. (2024) further contribute to this discourse by proposing that pre-class video creation fosters a more active learning environment, encouraging students to take ownership of their education. Martínez-Fernández et al. (2024) echo this concept of student agency by exploring regulation profiles in flipped classrooms and finding that students with higher self-regulation manifest greater academic satisfaction and success.

Another relevant aspect is the improvement in self-regulation and autonomy of learning, as pointed out by Du et al. (2023) and Holloway et al. (2024), who explored how direct and indirect recommendations within gamified online activities fostered self-regulated learning in a flipped classroom environment, leading to improved autonomy and the formation of more independent and lifelong learning-ready learners, a key competence in the 21st century.

CONCLUSIONS AND IMPLICATION

The literature review on the effects of gamification on learning in the context of the inverted classroom in basic education shows that the integration of ludic elements has been fundamental to increase academic motivation, since it allows interactive and attractive learning, awakening greater interest and dedication in students, which favors the acquisition of knowledge in a more effective and sustained manner.

Another notable effect is the increase in autonomy in learning as they become active agents in their own academic process, developing self-regulation skills, thus improving their performance and content retention. In the same way, academic satisfaction is also positively impacted by creating a more interactive and personalized environment, increasing students' satisfaction with the learning process.

This systematic literature review reveals valuable implications for contemporary education by highlighting the need for educational institutions to adopt strategies that are effective in the learning of complex subjects, such as programming and social sciences, by making use of interactive tools such as educational games and gamified digital platforms. Indeed, they reveal the importance of instructing educators on the previously mentioned practices, as they can promote the change that traditional education currently needs by exploring the use of challenge-based gamification programs, demonstrating that these strategies increase not only academic performance, but also students' intrinsic motivation and "flow" during learning activities.

Limitations

Current studies tend to focus on very specific educational contexts, such as programming courses or language teaching, which restricts the applicability of the results to other disciplines where the impact of these methodologies has not yet been explored in depth. In addition, most of the studies come from countries with advanced technological infrastructures and high access to digital resources, which leaves a significant gap in the understanding of how these methodologies could be implemented in regions with less access to technology, such as Latin America.

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Ethics declaration: The authors declared that the present review did not require ethical approval because the approach is a literature review of various scientific articles obtained from reliable, open-access databases.

Declaration of interest: The authors declare no competing interest.

Data availability: Data generated or analyzed during this study are available from the authors on request.

REFERENCES

- Acosta-Medina, J. K., Torres-Barreto, M. L., & Cárdenas-Parga, A. F. (2021). Students' preference for the use of gamification in virtual learning environments. *Australasian Journal of Educational Technology*, 37(4), 145–158. <https://doi.org/10.14742/ajet.6512>
- Adams, S. P., & Du Preez, R. (2022). Supporting student engagement through the gamification of learning activities: A design-based research approach. *Technology Knowledge and Learning*, 27(4), 119–138. <https://doi.org/10.1007/s10758-021-09500-x>
- Aidoo, B., Macdonald, M. A., Vesterinen, V.-M., Pétursdóttir, S., & Gísladóttir, B. (2022). Transforming teaching with ICT using the flipped classroom approach: Dealing with COVID-19 pandemic. *Education Sciences*, 12(6), Article 421. <https://doi.org/10.3390/educsci12060421>
- Alhalafawy, W. S., & Tawfiq Zaki, M. Z. (2022). How has gamification within digital platforms affected self-regulated learning skills during the COVID-19 pandemic? Mixed-methods research. *International Journal of Emerging Technologies in Learning*, 17(06), 123–151. <https://doi.org/10.3991/ijet.v17i06.28885>
- Alkhalaf, M. (2023). Flipped classroom approach in EFL context: Implementing self-regulated learning to improve students' performance in use of grammar. *International Journal of English Language and Literature Studies*, 12(3), 238–253. <https://doi.org/10.55493/5019.v12i3.4869>
- Al-Said, K., Krapotkina, I., Gazizova, F., & Maslennikova, N. (2023). Distance learning: Studying the efficiency of implementing flipped classroom technology in the educational system. *Education and Information Technologies*, 28(10), 13689–13712. <https://doi.org/10.1007/s10639-023-11711-x>
- Anane, C. (2022). Gamified flipped learning in a French foreign language class: Efficiency and student perception. *Frontiers in Education*, 7. <https://doi.org/10.3389/feduc.2022.994892>
- Antonelli, D., Christopoulos, A., Laakso, M.-J., Dagienė, V., Juškevičienė, A., Masiulionytė-Dagienė, V., Mądziel, M., Stadnicka, D., & Stylios, C. (2023). A virtual reality laboratory for blended learning education: Design, implementation, and evaluation. *Education Sciences*, 13(5), Article 528. <https://doi.org/10.3390/educsci13050528>
- Baah, C., Govender, I., & Subramaniam, P. R. (2023). Exploring the role of gamification in motivating students to learn. *Cogent Education*, 10(1), Article 2210045. <https://doi.org/10.1080/2331186X.2023.2210045>
- Briner, R., & Denyer, D. (2012). Systematic review and evidence synthesis as a practice and scholarship tool. In D. M. Rousseau (Ed.), *The Oxford Handbook of Evidence-Based Management: Companies, Classrooms and Research*. (pp. 112–129) New York University Press. <https://doi.org/10.1093/oxfordhnb/9780199763986.013.0007>
- Carrion, E., Sotomayor, S., & Medel, I. (2022). The use of video games and gamification as innovative teaching material for learning social sciences in higher education. *Edmetic*, 11(2). <https://doi.org/10.21071/edmetic.v11i2.13663>
- Cevikbas, M., & Kaiser, G. (2022). Can flipped classroom pedagogy offer promising perspectives for mathematics education on pandemic-related issues? A systematic literature review. *ZDM-Mathematics Education*, 54, 177–191. <https://doi.org/10.1007/s11858-022-01388-w>
- Chen, M.-F., Chen, Y.-C., Zuo, P.-Y., & Hou, H.-T. (2023). Design and evaluation of a remote synchronous gamified mathematics teaching activity that integrates multi-representational scaffolding and a mind tool for gamified learning. *Education and Information Technologies*, 28(1), 13207–13233. <https://doi.org/10.1007/s10639-023-11708-6>
- Cheng, K. M., Koo, A. C., Nasir, J. S. B. M., & Wong, S. Y. (2022). An evaluation of online EdCraft gamified learning (EGL) to understand motivation and intention of recycling among youth. *Scientific Reports*, 12, Article 14843. <https://doi.org/10.1038/s41598-022-15709-2>
- Corrales, M. (2023). Gamification and the history of art in secondary education: A didactic intervention. *Education Sciences*, 13(4), Article 389. <https://doi.org/10.3390/educsci13040389>

- Da Silva, L. R., Souza-Pinho, M. J., Santos de Jesus, M., & Kalil, A. (2022). Educational games in the high school: Implicate future teachers in the pursuit for new teaching strategies. *International Journal of Educational Research and Innovation*, 2022(17), 27–44. <https://doi.org/10.46661/ijeri.4574>
- Downie, S., & Proulx, S. (2022). Investigating the role of gamification in public libraries' literacy-centered youth programming. *International Journal of Play*, 11(4), 382–404. <https://doi.org/10.1080/21594937.2022.2136637>
- Du, J., Hew, K. F., & Li, L. (2023). Do direct and indirect recommendations facilitate students' self-regulated learning in flipped classroom online activities? Findings from two studies. *Education Sciences*, 13(4), Article 400. <https://doi.org/10.3390/educsci13040400>
- Durrani, U., Hujran, O., & Al-Adwan, A. S. (2022). CrossQuestion game: A group-based assessment for gamified flipped classroom experience using the ARCS model. *Contemporary Educational Technology*, 14(2), Article ep355. <https://doi.org/10.30935/cedtech/11568>
- Eusoff, R., Zin, A. M., & Salleh, S. M. (2022). A flipped classroom framework for teaching and learning of programming. *International Journal on Advanced Science, Engineering and Information Technology*, 12(2), 539–549. <https://doi.org/10.18517/ijaseit.12.2.14909>
- Firdousi, S. F., Yong, C., Amir, B., & Waqar, A. (2024). The influence of student learning, student expectation, and quality of instructor on student perceived satisfaction and student academic performance: Under online, hybrid, and physical classrooms. *Open Education Studies*, 1, Article 0240016. <https://doi.org/10.1515/edu-2024-0016>
- Greaves, R., & Vlachopoulos, D. (2023). The use of gamification as a vehicle for pedagogic sharing and teachers' professional development. *Revista Iberoamericana de Educacion a Distancia*, 26(1), 245–264. <https://doi.org/10.5944/ried.26.1.34026>
- Han, S. (2022). Flipped classroom: Challenges and benefits of using social media in English language teaching and learning. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.996294>
- Holguin-Alvarez, J., Apaza-Quispe, J., Cruz-Montero, J., Ruiz-Salazar, J. M., & Acha, D. M. H. (2022). Mixed gamification with video games and educational platforms: A study on mathematical cognitive demand. *Digital Education Review*, 42, 136–153. <https://doi.org/10.1344/der.2022.42.136-153>
- Holloway, L. R., Miller, T. F., da Camara, B., Bogie, P. M., Hickey, B. L., Lopez, A. L., Ahn, J., Dao, E., Naibert, N., Barbera, J., Hooley, R. J., & Eichler, J. F. (2024). Using flipped classroom modules to facilitate higher-order learning in undergraduate organic chemistry. *Journal of Chemical Education*, 101(2), 490–500. <https://doi.org/10.1021/acs.jchemed.3c00907>
- Huang, L., Wang, K., Li, S., & Guo, J. (2023). Using WeChat as an educational tool in MOOC-based flipped classroom: What can we learn from students' learning experience? *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.1098585>
- Huesca, G., Campos, G., Larre, M., & Pérez-Lezama, C. (2023). Implementation of a mixed strategy of gamification and flipped learning in undergraduate basic programming courses. *Education Sciences*, 13(5), Article 474. <https://doi.org/10.3390/educsci13050474>
- Izadpanah, S. (2022). The impact of flipped teaching on EFL students' academic resilience, self-directed learning, and learners' autonomy. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.981844>
- Joy, P., Panwar, R., Azhagiri, R., Krishnamurthy, A., & Adibatti, M. (2023). Flipped classroom—A student perspective of an innovative teaching method during the times of pandemic. *Medical Education*, 24(2), Article 100790. <https://doi.org/10.1016/j.edumed.2022.100790>
- Kaya, O. S., & Ercag, E. (2023). The impact of applying challenge-based gamification program on students' learning outcomes: Academic achievement, motivation, and flow. *Education and Information Technologies*, 28, 10053–10078. <https://doi.org/10.1007/s10639-023-11585-z>
- Kazu, İ. Y., & Kuvvetli, M. (2023). A triangulation method on the effectiveness of digital game-based language learning for vocabulary acquisition. *Education and Information Technologies*, 28, 13541–13567. <https://doi.org/10.1007/s10639-023-11756-y>
- Khodabandeh, F. (2022). Exploring the viability of augmented reality game- enhanced education in WhatsApp flipped and blended classes versus the face-to-face classes. *Education and Information Technologies*, 28(1), 617–646. <https://doi.org/10.1007/s10639-022-11190-6>

- Martínez-Fernández, J. R., Noguera-Fructuoso, I., Ciraso-Calí, A., & Vega-Martínez, A. (2024). An exploratory study of university students' regulation profiles. *Revista Española de Pedagogía*, 82(287), 111–124. <https://doi.org/10.22550/2174-0909.3931>
- Ma, Y., Wei, C., & Huang, F. (2024). A full-flipped classroom mode from the perspective of Junior High School English teachers. *Heliyon*, 10, Article e24864. <https://doi.org/10.1016/j.heliyon.2024.e24864>
- 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(9), Article 5428. <https://doi.org/10.3390/su14095428>
- Liu, J., Cao, S., Liu, X., Ye, C., & Siano, P. (2024). Pre-class mode “flipped” again: Making videos instead of just watching them. *Heliyon*, 10, Article e28105. <https://doi.org/10.1016/j.heliyon.2024.e28105>
- Suire, K., Hastert, M., Herrmann, S. D., & Donnelly, J. E. (2024). Feasibility of the flipped classroom approach for health education in a clinical weight loss program. *Patient Education and Counseling*, 106, Article 100308. <https://doi.org/10.1016/j.pecinn.2024.100308>

