Digital Technologies In Education: A Systematic Review On The Use Of Gamification As A Mediating Tool In The Teaching And Learning Process

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Abstract:
This research aimed to analyze the applicability of gamification as a tool for mediating the teaching and learning process. As a method, a systematic review was carried out following the PRISMA guidelines. Searches were conducted in databases such as Scielo, Web of Science and Google Scholar, using specific terms, Boolean operators and inclusion/exclusion criteria to select articles in Portuguese published between 2021 and 2023. As a result, a sample of 7 articles was obtained, where it was found that the insertion of playful and interactive elements through gamification not only motivates individual students, but also promotes a more inclusive and accessible educational environment, overcoming physical barriers and costs associated with traditional practices. Gamification, notably through digital games, stands out for making learning engaging and adaptable to different educational contexts, emphasizing active student participation and the development of complex skills. During contemporary challenges, such as remote learning, gamification not only keeps students interested, but strengthens community ties in a context of physical distancing. Despite the obvious benefits, it is crucial to recognise challenges, such as potential adverse psychological effects, requiring continuous evaluation and adaptation. Thus, we conclude that gamification is not ephemeral, but a lasting strategy for evolving educational methods, recognising its effectiveness in motivating students and promoting a collaborative culture, highlighting the constant need for innovation and adaptation to the demands of the new generation.
Key Word: *Gamification, Digital technologies; Education; Teaching; Learning.*

I. Introduction

In recent years, society has witnessed a revolution in the field of education: the increasing integration of digital technologies. This phenomenon is not just a trend, but a paradigm shift that is redefining the way people learn and teach. Digital technologies in education are catalysts for innovation, democratizing access to knowledge, broadening educational horizons and promoting more dynamic and personalized interactions (VIDAL; MIGUEL, 2020).

The growing ubiquity of electronic devices, coupled with the expansion of connectivity, has triggered a revolution in the classroom, enabling educators and students to explore new frontiers of learning. The traditional one-way approach to transmitting knowledge is giving way to more dynamic and participatory educational environments. Interaction between students and educators is enhanced by online platforms, multimedia

resources and collaborative tools, allowing for more engaging learning tailored to individual needs (MODELSKI; GIRAFFA; CASARTELLI, 2019).

In this scenario, gamification is emerging as a tool that can be applied to the teaching and learning process. In the educational context, gamification refers to the application of game elements and mechanics to make the learning process more engaging and interactive. This approach seeks to take advantage of the characteristic dynamics of games to motivate students, promote active participation and stimulate interest in educational content. By incorporating elements such as scores, rewards and challenges, gamification provides a playful approach that can make educational activities more attractive and engaging for students, contributing to a more dynamic and motivating learning environment (OLIVEIRA; PIMENTEL, 2020).

Gamification thus encompasses strategies that transcend conventional teaching methods, introducing elements from the world of games into the educational context and promoting innovative and engaging learning experiences. At the heart of gamification is the conscious application of elements such as narrative, challenges, rewards, friendly competition and co-operation to create an environment that intrinsically motivates students (BARBOSA; AMARAL, 2021).

Given this context, the aim of this research was to analyze the applicability of gamification as a tool for mediating teaching in educational institutions. It is hoped that this research will shed light on the impact of gamification on the educational process, investigating how this approach influences student motivation, teaching effectiveness and skills development.

At the end of this research, we hope to provide theoretical and practical support for educators, educational managers and others interested in improving the teaching process. Based on the results obtained, it will be possible to consider strategies for integrating gamification in a more informed way and in line with pedagogical objectives, with the aim of enhancing the students' learning experience and contributing to the continuous advance in the field of education driven by technological innovations and emerging pedagogical practices.

II. Material And Methods

Type of research

This research was characterized as a systematic review, since its purpose was to carry out a comprehensive and organized analysis of the available literature on the applicability of gamification in the educational context. As Brizola and Fantin (2016) point out, a systematic review is recommended when an impartial and comprehensive synthesis of existing evidence is sought, providing a critical and structured analysis of the academic contributions relevant to the topic.

Donato and Donato (2019) emphasize that systematic reviews are particularly valuable in areas where the number of studies is significant, as is the case with gamification in education, and when the aim is to identify gaps in knowledge, assess the consistency of results and provide a consolidated view of the current state of research. The methodical approach of the systematic review, guided by well-defined protocols, allows for a more in-depth understanding of the field of study, contributing to theoretical grounding and evidence-based decision-making.

In this research, the systematic review was conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, ensuring a rigorous and transparent method for selecting and analyzing the included studies. The use of the PRISMA guidelines in this research provided a standardized structure for conducting and presenting the results, promoting transparency and replicability of the process. This ensured that other researchers could reproduce the review in a consistent manner, strengthening the reliability and validity of the findings presented, corroborating what Galvão and Ricarte (2019) suggest.

Search platforms and surveys

To carry out the systematic review, the Scielo and Google Scholar search platforms were strategically chosen, recognised for their comprehensiveness and relevance in accessing a wide range of scientific articles. These platforms were selected due to their ability to index publications from various disciplines and offer a comprehensive view of the academic landscape related to gamification in education.

The search was conducted using key terms related to gamification and education, combined with Boolean operators "AND" and "OR" to refine the results. The inclusion of these operators allowed specific terms to be combined, increasing precision in the selection of studies relevant to the scope of the research. Key terms such as "gamification", "contribution", "teaching", "school" and "learning" were used.

The application of Boolean operators "AND" and "OR" enabled a refined search that allowed the inclusion of studies that address both gamification in general terms and its specific contributions to teaching and learning.

Inclusion criteria

In conducting this systematic review, a series of inclusion criteria were strategically established to guide the careful selection of studies to be analyzed. The main delimitation was the choice to focus exclusively on scientific articles, a decision aimed at ensuring the depth and reliability of the contributions considered by prioritizing academic research with rigorous methods.

In addition, the geographical restriction to articles of Brazilian nationality was implemented to provide a more specific perspective on the implications of gamification in the Brazilian educational context. This approach allowed for a more contextual analysis, considering the nuances and particularities of the country's education system.

As for timing, the choice to include only articles published between 2021 and 2023 sought to reflect the most recent trends in the field of gamification in education. This time restriction ensured that the review was in line with contemporary developments, providing an up-to-date view of the latest practices and research.

The central inclusion criterion centered on the specific topic covered by the articles: the contributions of gamification to teaching in schools. This specificity ensured that the selected studies were directly aligned with the focus of the research, allowing for an in-depth analysis of the pedagogical implications and effects of gamification in the school environment.

Thus, the careful application of these criteria was essential to ensure that the articles chosen offered relevant and current information, providing a comprehensive and consistent view of the impact of gamification on teaching, especially in Brazilian schools. This methodological approach contributed to the robustness and relevance of the systematic review, ensuring that the results accurately reflected the most recent trends and advances in the field of study.

Exclusion criteria

When defining the exclusion criteria, the aim was to guarantee the cohesion and quality of the systematic review. Firstly, theses, dissertations, duplicate articles, monographs and other academic formats were excluded, prioritizing the specific analysis of scientific articles published in scientific journals and magazines in order to maintain uniformity in the methodological approach.

In addition, we chose to exclude articles from other nationalities, focussing exclusively on Brazilian studies. This choice aims to provide a more contextualized and specific analysis of the contributions of gamification to teaching in schools in the Brazilian educational scenario.

Another important exclusion criterion included articles not directly associated with the topic of gamification in school teaching. This measure ensured that the selected studies were aligned with the specific scope of the research, avoiding deviations from the focus that could jeopardize the relevance and consistency of the results.

Analyzing the data

In the process of analyzing the data, two distinct screening phases were adopted to ensure a careful selection of the studies to be included in the systematic review: initial screening and full screening.

The initial screening phase consisted of reading the abstracts, analyzing the titles and checking where the articles were published. The aim of this stage was to carry out a preliminary assessment to identify studies that aligned with the established inclusion criteria. Abstracts and titles were essential for determining thematic relevance, while checking the place of publication made it possible to discard any studies that were not published in scientific journals.

After the initial screening, the selected studies underwent a thorough analysis. At this stage, each article was examined in detail to assess its adherence to the inclusion criteria and to extract pertinent information. The analysis included a review of the methods used, results achieved, discussions presented and conclusions reached. This more in-depth process allowed for a more complete understanding of the contributions of gamification to teaching in schools, considering the specific context of the research.

These screening phases were implemented in a systematic and judicious manner to ensure consistency and quality in the selection of studies. The sequential approach, starting with an initial screening based on abstracts and titles, followed by a thorough analysis of the articles, contributed to a robust and comprehensive systematic review.

Figure 1. Process of the systematic review in this research
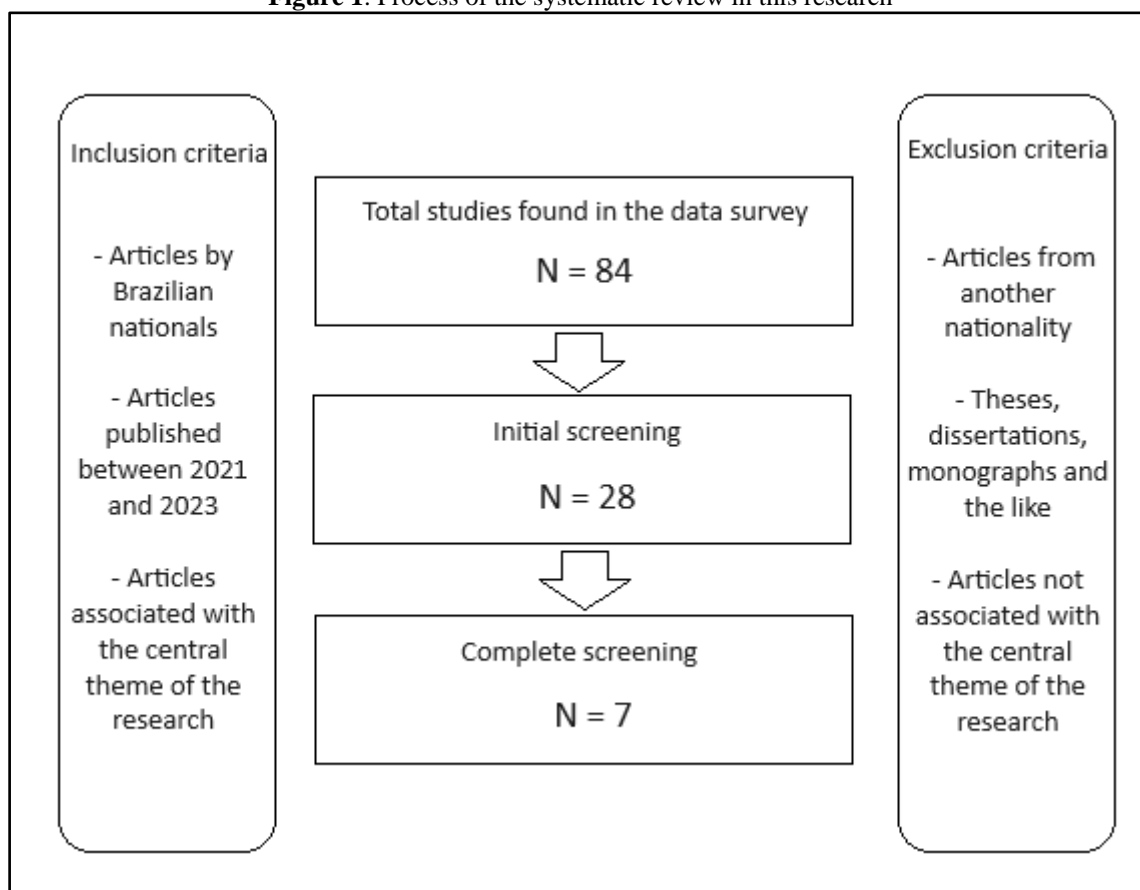
Source: Research data (2023).

III. Result and discussions

After surveying the articles, a sample of seven was obtained, as shown in Table 1.

Table 1. Systematic review

Authors	Research objectives	Methodology	Conclusions
Brito e Silva (2022)	To discuss the effects and contribution of cyberculture and gamification in the development of learning within the context of formal education.	Literature review	Gamification reveals beneficial results in the learning process in various areas of knowledge. These results are closely linked to the motivational capacity inherent in games, especially due to the virtual social interactions promoted by cyberculture. The use of gamification, through appropriate digital games, stands out for its playful characteristics that adapt flexibly to different educational contexts, giving practical materiality to the content studied. It is also worth emphasizing the positive impact of digital games on inclusive activities, since they reduce the costs associated with virtual visits to laboratories, museums and other learning spaces. In addition to easier access, this approach provides students with new ways of acquiring knowledge and exchanging experiences, enriching educational practice in a significant way.

Neto, Penteado and Carvalho (2023)	Analyzing how gamification contributes to the teaching-learning process	Integrative review	The results showed that the use of gamification stimulates learning in several ways, including improved teacher-student interaction, the perception of leisure as an integral part of the learning process and better assimilation of information. These factors contribute to the development of complex thinking and the effectiveness of the teaching-learning process. However, there have also been reports of possible adverse psychological impacts on students involved in gamified activities, such as changes in sleep, mood and appetite, as well as indications of social isolation and obsessive behavior. This emphasizes the need for further studies to assess both the advantages and disadvantages of this methodology, as well as ways of circumventing the negative impacts identified. This critical approach is essential for the continuous evolution and improvement of the use of gamification in the educational environment.
Wetterrich and Costa (2022)	Analyzing the influence of gamification on student engagement and motivation in relation to the subject Digital Electronics, in the Electrical and Electronics Technical course at IFNMG-Advanced Campus Porteirinha	Qualitative research	The text highlights the importance of using gamification as a teaching methodology, showing that a more dynamic approach results in greater student motivation to participate in classes, facilitates the understanding of complex content and promotes greater interaction between students and teachers. These results are especially relevant in the context of the pandemic and the challenges of remote teaching. The positive impact of gamification on student motivation and engagement suggests the need to rethink traditional teaching, incorporating moments of interaction and active learning. In short, the diversification of methodologies can be fundamental to improving the quality of teaching, making it more engaging and effective.
Camargo et al. (2022)	Use the Gamification methodology and analyze how the use of the "Game of Fractions" Framework contributes to the teaching-learning process.	Qualitative research	The results showed that, in the first phase, the students faced challenges in fractional operations, but throughout the process, they showed greater confidence and understanding. Gamification provided moments of enthusiasm and interest, making lessons more dynamic and moving away from traditionalism. It is concluded that gamification contributed positively to student engagement and concentration, overcoming difficulties and suggesting reflections on the introduction of this approach in the teaching of mathematical content, especially fractions.
Tavares et al. (2021)	Analyzing the role of gamification in engaging and developing primary school students.	Bibliographical research	Gamification, combined with playfulness, offers an opportunity to improve learning by taking advantage of various tools in the educational process. This allows teachers to develop skills in students, creating the conditions to articulate theory and practice in a playful, dynamic and engaging way. Gamification seeks to promote the (re)construction of the school curriculum, adapting it to the needs of the new generation.
Santos, Assis and Baluz (2021)	Produce a study on the main techniques, approaches and tools for using gamification in Virtual Learning Environments (VLE) in Higher Distance Education (HE).	Bibliographical research	The research highlights gamification as a promising strategy in distance higher education (ODL), aimed at engaging students effectively and recontextualising the acquisition of knowledge. The implementation of gamification in the virtual learning environment (VLE) features extensive and dynamic resources, motivating student participation through visual and interactive tools. The results point to the success of gamification in promoting learning, overcoming previous deficiencies and making the process more engaging. The study suggests that teachers use specific approaches, such as Killers, Explorers, Achievers and Socialisers, to promote engagement and curiosity. Various VLE platforms are mentioned, highlighting the need for ongoing training for teachers. The conclusion is that gamification must be integrated into distance learning, requiring knowledge and creativity on the part of teachers to adapt to the demands of the new generation of students. The research proposes reflections and further studies on gamification pedagogical practices to better cater for virtual active methodologies in distance higher education.

| Cruz et al. (2021) | To present a bibliometric analysis of scientific publications on gamification, with the aim of highlighting suggestions for application in teaching and student learning. | Bibliometric and exploratory research with a quantitative approach | This article emphasizes that gamification in education has the potential to encourage knowledge sharing in learning groups, providing a stimulus for innovation, interaction and information sharing among students. Despite being a relatively new approach in the educational context, gamification is presented as a tool that adds value to the execution of student tasks, facilitating the teaching and learning process. The analysis of the articles suggests the application of gamified activities to aid teaching, using elements of games to expand content and streamline subject knowledge in the classroom. The research aims to contribute to the debate on gamification in improving teaching, exploring the engagement that this approach provides. The results also seek to create greater familiarity between teachers and students in relation to the subject. |

Source: Research data (2023).

The systematic review shows the contributions of gamification to teaching in educational institutions. As Brito and Silva (2022) point out, gamification, as an educational strategy, is emerging as a promising tool that reveals beneficial results in the learning process. These benefits are notably attributed to the powerful motivational capacity intrinsic to games, a dynamic that is strikingly aligned with the virtual social interactions driven by cyberculture.

Exploring the potential of gamification, especially through digital games, highlights its ability to incorporate playful features that capture students' interest, making learning more engaging and adaptable to a variety of educational contexts. Furthermore, it is notable that gamification not only enhances the learning process itself, but also demonstrates positive impacts on inclusive activities. This innovative approach not only overcomes the physical barriers and costs associated with certain educational practices, such as visits to laboratories or museums, but also offers an effective way of engaging students, providing them with new ways of acquiring knowledge and sharing experiences.

In this way, gamification not only strengthens students' individual motivation, but also contributes to building a more inclusive and accessible educational environment. By incorporating game elements into the educational process, gamification stands out as a dynamic tool that goes beyond the mere transmission of information. Gamification creates an atmosphere that encourages active student participation, promoting not only the assimilation of knowledge, but also the development of complex skills such as problem-solving and critical thinking. This approach provides a more complete learning experience in which students are challenged in a playful way, encouraging innovation and interaction between them.

In a complementary way, Neto, Penteado and Carvalho (2023) emphasize that when gamification is used as a strategy in the teaching process, it proves to be an effective stimulant for learning, promoting a more dynamic interaction between teacher and student. In addition, its ability to integrate leisure as an intrinsic part of the educational process contributes to a more positive perception of learning. This innovative approach also stands out in facilitating the assimilation of information, providing students with an environment that is more conducive to absorbing knowledge.

However, it is crucial to recognise that, despite the obvious benefits, gamification is not without its challenges and possible negative impacts. Concerns have been raised about potential adverse psychological effects on students taking part in gamified activities. These can include changes in sleep patterns, mood and appetite, as well as indications of social isolation and obsessive behavior.

Wetterrrich and Costa (2022) emphasize that gamification has emerged as a significant boost to student engagement and motivation, especially in challenging scenarios such as remote teaching during the pandemic. The dynamic approach offered by gamification not only maintains students' interest, but also strengthens bonds within the educational community, crucial in a context of physical distancing.

By transforming learning into an engaging and challenging experience, gamification helps to mitigate the emotional and motivational challenges faced by students during periods of isolation. Not only does gamification serve as a stimulus for active student participation, but it also simplifies the understanding of complex concepts. By incorporating game elements into educational topics, it makes the learning process more accessible and engaging. The enhanced interaction between students and teachers promoted by the dynamics of games creates a favorable environment for the exchange of ideas, constructive discussions and collaboration, all of which are crucial for meaningful learning.

Thus, gamification not only fulfills the need to keep students interested, but also proves to be an effective strategy for tackling the specific challenges of remote education. Its positive impact on motivation, engagement and interaction contributes to building a more resilient and adaptable educational environment, capable of overcoming the adversities imposed by extraordinary circumstances, such as those experienced during the pandemic.

The research conducted by Camargo et al. (2022) presents significant conclusions about the effectiveness of the "Game of Fractions" framework in gamification, especially in the context of teaching

mathematical content. The results indicate a positive contribution of this approach to the students' learning process. The implementation of the framework not only generated satisfactory results, but also introduced an innovative dynamic into the educational environment.

The dynamic approach adopted by the "Fractions Game" proved to be effective in generating enthusiasm and interest on the part of the students. The observation of enthusiasm suggests that gamification not only captivated students' attention, but also involved them in an active and participatory way in activities related to fractions. This active involvement is crucial for more effective learning, as students tend to retain knowledge better when they are motivated and engaged.

By moving away from traditionalism, the dynamic gamification approach proved capable of breaking with conventional teaching methods, introducing a more modern and attractive perspective to learning mathematical concepts such as fractions. This move away from traditionalism can be interpreted as a positive response from the students, indicating that the innovative approach of gamification is capable of meeting the expectations of the new generation of students, who are more connected and familiar with the digital environment.

The suggestion of reflections on the introduction of this methodology in teaching emphasizes the importance of considering gamification as a valuable tool in the educational arsenal. The need for reflection highlights the importance of continually evaluating the effectiveness of this approach, adapting it as necessary to meet the constantly evolving demands of the educational environment. This reflective consideration also points to the need for education professionals to be open to innovation and ready to adjust their pedagogical practices in search of a more effective and engaging learning experience.

For Tavares et al. (2021), the connection between gamification and playfulness highlights the importance of more engaging and playful approaches to teaching. By incorporating elements of games and interactivity, gamification offers a dynamic and attractive alternative to the traditional teaching approach. The association with playfulness suggests that learning can be more effective when the elements of fun and play are integrated into the educational process.

The research by Tavares et al. (2021) highlights gamification as a tool that goes beyond the simple transmission of information. It creates opportunities for students to develop skills, going beyond specific content and addressing aspects such as problem-solving, teamwork and critical thinking. This emphasis on skills emphasizes the importance of preparing students not only with theoretical knowledge, but also with the practical skills needed to face the challenges of the contemporary world.

In this respect, the quest to (re)construct the school curriculum highlights the need to adapt to the characteristics and demands of the new generation of students. The dynamics of gamification and its association with playfulness suggest a flexible approach that can more easily adjust to the expectations of students who have grown up in a digital and interactive environment. By highlighting the importance of this adaptation, the research emphasizes the ongoing need for evolution and innovation in the educational field.

Santos, Assis and Baluz (2021) emphatically conclude on the promising contribution of gamification in the context of distance learning. The results show that gamification, when implemented effectively, emerges as a strategy capable of significantly motivating student participation, using visual and interactive tools. The conclusion emphasizes the importance not only of the presence of gamification, but also of its successful implementation.

By overcoming previous deficiencies in the educational process, gamification demonstrates its potential to make teaching more engaging and therefore effective. This effectiveness is seen not only in student motivation, but also in the ability to provide a richer and more dynamic learning experience. The promising strategy of gamification in distance higher education is emphasized as an effective means of meeting the challenges characteristic of this educational format.

The ability to engage students through visual and interactive tools emphasizes the importance of adapting educational practices to the characteristics of the new generation, which is increasingly immersed in the digital environment. By referring to the process as more engaging, the conclusion highlights gamification's ability to transform learning into a more attractive and interactive experience. This approach not only meets the demands of students accustomed to technology, but also responds to the need to make distance higher education closer and more in line with contemporary learning expectations.

Thus, the research suggests that gamification, when implemented effectively, not only motivates students, but also represents a viable solution for improving the quality of distance higher education. The conclusion reinforces the continued importance of exploring and improving innovative strategies in the educational context, especially in the face of rapid changes in the technological and cultural landscape.

Cruz et al. (2021) unequivocally concluded that gamification in education has considerable potential to stimulate knowledge sharing in learning groups. The results obtained point to an approach that not only encourages, but also promotes innovation, interaction and the exchange of information between participants in the educational process.

Despite being a relatively new approach in the educational context, gamification is highlighted as a valuable tool for facilitating teaching and learning. The conclusion emphasizes the fundamental role played by this innovative strategy in transforming traditional classroom dynamics. By incorporating playful and interactive elements, gamification creates a favorable environment for student engagement and the collective construction of knowledge.

The emphasis on gamification's potential to encourage knowledge sharing suggests that this approach not only meets individual learning needs, but also promotes a collaborative culture. Encouraging innovation and interaction highlights gamification's ability to not only transmit information, but also create a space where participants feel motivated to explore, create and share ideas.

The conclusion of the research highlights that even though gamification is a recent approach, it is positioned as a valuable and promising tool for facilitating not only teaching, but also the learning process. This perspective suggests that gamification is not just a passing fad, but a strategy that can play a significant role in the ongoing evolution of educational methods. Recognising gamification as a valuable tool indicates the need to further explore its potential and integrate it more widely into the educational landscape.

IV. Conclusion

The systematic review of gamification in the educational context shows that gamification is a promising tool for improving the teaching and learning process. By incorporating playful and interactive elements, gamification proves to be effective not only in motivating individual students, but also in promoting a more inclusive and accessible educational environment. The ability to overcome physical barriers and costs associated with traditional practices, coupled with its positive influence on inclusive activities, highlights the versatility and relevance of this approach.

The application of gamification, especially through digital games, demonstrates its ability to make learning more engaging and adaptable to different educational contexts. The emphasis on active student participation, stimulating not only the assimilation of knowledge but also the development of complex skills, emphasizes the transformative potential of gamification in the educational process. The systematic review also looks at gamification as a response to contemporary challenges, such as remote teaching during the pandemic.

In this context, the dynamic approach offered by gamification not only maintains students' interest, but also strengthens bonds within the educational community, crucial in a context of physical distancing. While the benefits of gamification are evident, it is important to recognise that the approach is not without its challenges, such as potential adverse psychological effects. The need for continuous evaluation and adaptation, as emphasized by several authors, highlights the importance of a reflective and flexible approach when incorporating gamification into the educational environment.

Given the conclusions of the various studies analyzed, it can be said that gamification is not just a passing fad, but a strategy with lasting potential to continually evolve educational methods. Recognising its effectiveness, both in motivating students and in promoting a collaborative culture, points to the need to further explore its potential and integrate it more widely into the educational landscape. This perspective suggests not only the search for innovation, but also the constant need to adapt and evolve in the educational field, in line with the characteristics and demands of the new generation of students.

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