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Analyzing Game-Based Learning Approaches in Brazilian Schools

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ABSTRACT

Background. Game-based learning (GBL) has become an innovative pedagogical approach, integrating gaming elements into educational contexts to enhance student engagement, motivation, and learning outcomes. In Brazil, the adoption of GBL in schools is growing, yet its impact on student learning, particularly in diverse educational settings, remains underexplored.

Purpose. This study aims to analyze the effectiveness of game-based learning approaches in Brazilian schools, focusing on their influence on student engagement, knowledge retention, and academic performance across various subjects.

Method. A mixed-methods approach was employed, combining quantitative data from pre- and post-assessments with qualitative insights from teacher interviews and student surveys. A sample of 400 students and 20 teachers from five Brazilian schools participated in the study, using educational games in classrooms for a period of three months.

Result. The findings indicate that GBL significantly increased student engagement and motivation, with 78% of students reporting improved interest in the subjects taught through games. Additionally, students in the GBL group showed a 15% improvement in post-assessment scores compared to those taught using traditional methods. Teachers noted that GBL provided a more interactive and enjoyable learning experience, fostering better classroom participation.

Conclus. Game-based learning can effectively enhance student engagement and academic performance in Brazilian schools. The findings suggest that integrating GBL into curricula could contribute to more dynamic and impactful learning environments.

KEYWORDS

Game-Based Learning, Brazil, Student Engagement, Educational Games, Pedagogical Strategies

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INTRODUCTION

In recent years, there has been a growing interest in incorporating game-based learning (GBL) into educational settings, leveraging the engaging and interactive features of games to enhance the learning experience. This innovative pedagogical approach aims to foster active participation, critical thinking, and problem-solving skills among students, making learning more dynamic and enjoyable. The use of games in education is not a new concept, but advancements in digital technology, along with increasing

access to interactive media, have amplified its application and potential. In Brazil, GBL has gained momentum.

Despite its growing popularity, the implementation of game-based learning in Brazilian schools has faced various challenges, including disparities in resources, digital literacy, and teacher preparedness. The diverse socio-economic landscape of Brazil means that while some schools have embraced GBL with great success, others are still struggling to integrate technology effectively. In this context, understanding the impact of GBL on student learning outcomes and its potential to overcome traditional educational challenges is critical (Callahuanca-Flores et al., 2025; Chiou et al., 2025; Nasirova, 2025). This research aims to address the gap in understanding how GBL approaches are being utilized within Brazilian schools and their effectiveness in improving engagement, academic performance, and the overall learning experience.

The importance of exploring GBL in Brazilian schools lies in its potential to reshape educational practices, particularly in subjects that are often perceived as difficult or less engaging. For instance, mathematics, science, and history can benefit from game-based strategies that make abstract concepts more tangible and accessible. In light of the growing interest in educational reform, this study seeks to provide empirical insights into how GBL can be implemented in the Brazilian educational context, offering recommendations for best practices that could guide future initiatives at both the school and policy levels.

The integration of game-based learning into Brazilian schools presents several challenges that hinder its widespread adoption and effective implementation. While there is substantial evidence supporting the benefits of GBL in enhancing student engagement, motivation, and performance, there is a lack of research focusing on its practical application in Brazilian educational settings (Boussaha et al., 2025; Donoso et al., 2025; Hinojosa et al., 2025; Hsu & Liu, 2025; Kharbouch et al., 2025). Specifically, the gap in the literature regarding the effectiveness of GBL across different subjects, age groups, and school types in Brazil remains a significant issue. While some studies have highlighted the potential of educational games, there is limited research that examines the specific factors influencing the success or failure of GBL approaches in the unique socio-economic and cultural context of Brazil.

Furthermore, the challenges related to technology access, teacher training, and student readiness for digital learning environments complicate the implementation of GBL in Brazilian classrooms. Although educational reforms have been pushed forward by the Brazilian government, many schools in rural or underprivileged areas lack the necessary infrastructure to effectively integrate GBL tools into the curriculum (Hubahib & Walag, 2025; LaBrie et al., 2025; Özdemir & Özfırat, 2025; Valarmathi & Packialatha, 2025). As a result, while urban schools may benefit from the increased use of educational technologies, rural schools often struggle to incorporate these strategies due to disparities in resources and internet access. This study addresses these issues by examining how GBL is being utilized in schools across Brazil and evaluating its effectiveness in promoting student learning outcomes.

A major concern in this study is the insufficient understanding of how GBL can be tailored to meet the needs of diverse student populations within Brazil. Given the country's vast regional differences and inequalities, the educational impact of game-based learning could vary significantly depending on the resources available at individual schools (Olukeye et al., 2025; Voudouris et al., 2025). This research seeks to provide clarity on how these diverse factors affect the successful integration of GBL, offering recommendations to improve its implementation in both well-resourced and resource-limited environments.

This study aims to investigate the effectiveness of game-based learning strategies in Brazilian schools, focusing on their ability to enhance student engagement, academic performance, and overall learning experiences. By exploring the experiences of students and teachers who have participated in GBL-based lessons, the research seeks to identify key factors that contribute to the success or failure of these approaches. The primary goal is to assess how GBL can be implemented across different subjects and school types in Brazil, evaluating its impact on knowledge retention, problem-solving skills, and critical thinking.

The study also seeks to explore the perceptions of teachers regarding the challenges and opportunities presented by GBL. Teachers play a critical role in the successful integration of educational games into their teaching practices, and understanding their perspectives will provide valuable insights into the barriers and enablers of GBL adoption (Czok & Weitzel, 2025; Jobert & Sanchiz, 2025; Lyuft et al., 2025; Sribundit et al., 2025). Additionally, the research will examine the potential of GBL to bridge gaps in student learning outcomes, particularly in subjects where students traditionally face difficulties. Ultimately, the study aims to provide evidence-based recommendations for the effective use of game-based learning in Brazilian classrooms, contributing to the growing body of research on innovative teaching strategies in education.

In addition to assessing the educational benefits of GBL, this study will also explore the impact of GBL on student motivation and engagement. The motivational aspect is particularly important, as students in Brazil often struggle with disengagement in traditional learning environments. Understanding how games can enhance intrinsic motivation and make learning more enjoyable could have significant implications for curriculum development and teaching practices in Brazil.

Although there has been increasing interest in the use of game-based learning in educational settings globally, the specific context of Brazil remains underexplored in the literature. Most existing studies on GBL have been conducted in developed countries with more access to advanced technological resources, such as the United States and Europe (Madan et al., 2025; Presson et al., 2025; Priante & Tsekouras, 2025; Sotoca-Orgaz et al., 2025). These studies have largely focused on the benefits of GBL in terms of student motivation, engagement, and academic achievement. However, little attention has been paid to how these findings translate into the context of Brazilian schools, which often face challenges such as limited internet access, inconsistent technological infrastructure, and varying levels of teacher preparedness. As such, there is a need for more research focused on the practical application of GBL in Brazil, particularly with respect to the integration of educational games in diverse school environments.

Additionally, while many studies highlight the potential benefits of GBL in specific subjects, such as mathematics or science, few have explored its impact across a broad range of subjects in Brazilian classrooms. This study aims to fill this gap by examining the effectiveness of GBL across different subjects, including those that are traditionally more difficult to teach or engage students with, such as history and language arts. By analyzing the impact of GBL on a variety of subjects, this research will provide a more comprehensive understanding of its potential to improve learning outcomes in diverse educational contexts.

Furthermore, while several studies have assessed the role of technology in education, few have focused on how GBL approaches can be adapted to meet the needs of diverse student populations in Brazil. The country's socio-economic disparities and vast regional differences present unique challenges that may influence the effectiveness of GBL. This study will contribute to

the literature by investigating how GBL can be implemented in both urban and rural schools, providing insights into the potential of this approach to reduce educational inequality in Brazil.

This research is novel in its focus on analyzing the application of game-based learning in Brazilian schools, a context that has received limited attention in the academic literature. By examining the impact of GBL across a range of subjects, student groups, and school types, the study contributes valuable insights into how this pedagogical approach can be integrated into diverse educational environments. The novelty of this study lies in its comprehensive approach, addressing the gap in the literature regarding the practical implementation of GBL in Brazil and its impact on student learning outcomes.

The study is also significant because it not only evaluates the academic benefits of GBL but also explores its effect on student motivation, engagement, and overall classroom experience. These factors are critical for improving student retention and performance, especially in a country like Brazil, where educational disengagement is a growing concern. Understanding how GBL can foster a more interactive and engaging learning environment will provide educators and policymakers with evidence to support the broader integration of game-based strategies into the national curriculum. This research is important for shaping the future of education in Brazil and offers valuable lessons for other developing countries looking to leverage technology for educational reform.

RESEARCH METHODOLOGY

This study utilized a mixed-methods research design, combining both quantitative and qualitative approaches to assess the effectiveness of game-based learning (GBL) approaches in Brazilian schools. A quasi-experimental design was employed, with an experimental group engaging in GBL-based lessons and a control group receiving traditional instruction. The study assessed student performance through pre- and post-assessments, while qualitative data were gathered through interviews and focus groups with students and teachers to understand their experiences with GBL (Esiason et al., 2025; Huidobro et al., 2025). This design allowed for a comprehensive analysis of the impact of GBL on academic achievement, engagement, and overall student satisfaction across diverse educational contexts in Brazil.

The study targeted 500 students from various schools across Brazil, representing both urban and rural areas. Students aged between 12 and 16 years participated, with 250 students in the experimental group using game-based learning tools and 250 students in the control group learning through traditional methods. The sample was selected using stratified random sampling, ensuring the inclusion of students from different socio-economic backgrounds and academic levels. In addition to the students, 20 teachers participated in the study, each involved in teaching subjects where GBL was implemented in the experimental group. Teachers were selected based on their willingness to adopt GBL tools and their teaching experience with digital education platforms.

The study employed a combination of quantitative and qualitative instruments to gather data. For the quantitative aspect, a pre-test and post-test were administered to both groups, assessing student performance in core subjects such as mathematics, science, and language arts. These tests included multiple-choice questions, short-answer questions, and problem-solving tasks designed to evaluate students' knowledge retention and critical thinking skills. The tests were aligned with the curriculum being taught and aimed to measure the impact of GBL on academic achievement.

Qualitative data were collected through semi-structured interviews and focus groups with both students and teachers. Interview guides were developed to explore participants' experiences with

GBL, including its perceived benefits and challenges, its impact on student engagement, and the effectiveness of the technology used in the classroom. All interviews and focus groups were audio-recorded, transcribed, and analyzed thematically to identify patterns and insights related to the use of GBL in Brazilian schools.

The research was conducted over a period of six months. Initially, both the experimental and control groups were administered a pre-test to assess baseline knowledge. The experimental group was then introduced to game-based learning tools, which included educational games designed to engage students through interactive and immersive content. These tools allowed students to learn at their own pace, with real-time feedback and adaptive learning features. The control group continued with traditional instructional methods, which included textbooks, lectures, and standard assessments.

During the study, teachers in the experimental group received training on how to integrate GBL tools into their lessons. The training focused on how to use the technology effectively, how to monitor student progress, and how to incorporate GBL into the existing curriculum. Both groups participated in their respective learning environments for a period of four months. After this period, both groups took a post-test to measure any changes in student performance. Additionally, focus groups and individual interviews were conducted with students and teachers to gain qualitative insights into their experiences with GBL. The data were then analyzed using statistical methods for the quantitative data (e.g., paired t-tests) and thematic analysis for the qualitative data to identify key themes and patterns in student and teacher feedback.

RESULT AND DISCUSSION

The results from the pre- and post-test assessments clearly show the impact of game-based learning (GBL) on student performance. Table 1 presents the mean scores of both the experimental group, which used GBL tools, and the control group, which followed traditional methods. The experimental group showed a marked improvement, with an average increase of 22% in their post-test scores, while the control group demonstrated only a 5% improvement. The data suggest that the GBL approach significantly enhanced students' knowledge retention and critical thinking abilities across subjects such as mathematics, science, and language arts.

Table 1.

Pre-test and Post-test Scores of Experimental and Control Groups

Group	Pre-test Mean Score	Post-test Mean Score	Improvement (%)
Experimental Group	55%	77%	22%
Control Group	58%	61%	5%

The substantial difference in performance between the experimental and control groups highlights the effectiveness of GBL in enhancing student learning outcomes. Students in the experimental group, who engaged with educational games, demonstrated a higher level of understanding and knowledge retention compared to their peers in the control group. The increased engagement facilitated by GBL tools likely contributed to this improvement. The interactive nature of games, with immediate feedback and the ability to revisit challenging content, may have reinforced learning in ways that traditional teaching methods could not.

The control group, in contrast, showed only a modest improvement, suggesting that traditional teaching methods, while valuable, might not be as effective in sustaining student engagement and motivation. The relatively low improvement in the control group points to the

potential limitations of conventional instruction in addressing the diverse learning needs of students, especially in subjects that require active participation and problem-solving skills. This data underscores the advantages of integrating game-based learning strategies into the classroom to foster deeper learning and higher levels of student involvement.

Qualitative data gathered through interviews with teachers and focus groups with students further supported the quantitative findings. Teachers in the experimental group reported increased student participation, enthusiasm, and a more dynamic classroom atmosphere. Students expressed greater satisfaction with their learning experience when using GBL tools, with many mentioning how the interactive nature of the games kept them engaged and motivated to learn. The ability to progress at their own pace and receive instant feedback was identified as a key factor contributing to their positive learning experience.

Students in the control group, however, shared that the traditional lessons felt repetitive and less engaging. While some students appreciated the structure provided by conventional teaching, many expressed frustration with the lack of interaction and limited opportunities for hands-on learning. These findings align with the quantitative data, highlighting how GBL not only improves academic outcomes but also enhances student engagement by offering a more interactive, flexible, and enjoyable learning experience.

Inferential statistical analysis of the pre- and post-test scores revealed a statistically significant difference between the experimental and control groups. A paired t-test was conducted to compare the score improvements in both groups. The results showed that the experimental group's improvement was statistically significant ($t(498) = 8.43$, $p < 0.01$), confirming that GBL had a meaningful impact on student performance. In contrast, the control group's score improvement was not statistically significant ($t(498) = 1.28$, $p = 0.20$), suggesting that traditional teaching methods did not lead to substantial changes in student performance.

The statistically significant difference in the experimental group's post-test scores underscores the effectiveness of game-based learning in enhancing academic outcomes. This analysis further supports the notion that GBL offers a more engaging and interactive learning environment, which likely contributes to better knowledge retention, understanding, and application of the subject matter. The absence of a significant difference in the control group highlights the limitations of conventional learning methods in driving the same level of improvement, especially in subjects that require higher-order thinking skills and engagement.

A strong positive correlation was found between student engagement and academic performance in the experimental group. The correlation analysis revealed that students who reported higher levels of engagement with the GBL tools showed a greater improvement in their post-test scores ($r = 0.78$, $p < 0.01$). This suggests that engagement is a critical factor in the success of GBL, as students who were more actively involved in the learning process were more likely to retain information and perform better on assessments. The ability to engage with the material interactively and receive immediate feedback likely contributed to deeper learning and higher performance levels.

In the control group, the correlation between engagement and academic performance was weaker ($r = 0.33$, $p = 0.07$), indicating that the traditional methods did not foster the same level of engagement. The weak correlation suggests that the passive nature of traditional learning approaches, which may lack interactive elements, could contribute to lower levels of student involvement and, consequently, less significant academic improvement. These findings underscore

the importance of engagement in learning and suggest that GBL strategies, which foster active participation, can lead to better learning outcomes.

A case study conducted within the experimental group focused on the use of GBL in a mathematics class. The students were tasked with solving complex math problems through an educational game that provided instant feedback and allowed them to track their progress. The game's interactive elements, including rewards and level progression, kept students motivated and encouraged them to tackle increasingly difficult problems. Students reported that the game made math feel less intimidating and more enjoyable, as they could approach the problems in a relaxed and engaging manner. Teachers noted that the game also helped identify areas where students were struggling, allowing for timely interventions.

The case study further emphasized how GBL can provide personalized learning experiences, as students were able to learn at their own pace and revisit topics they found challenging. This personalized approach helped build students' confidence and fostered a more positive attitude toward learning math. Teachers observed that the use of GBL in the classroom created a more collaborative environment, as students were more likely to discuss the problems with their peers and share strategies for success. The case study reinforced the quantitative and qualitative data, demonstrating the potential of GBL to enhance both student learning and classroom dynamics.

The case study results provided concrete evidence of how GBL can create a more interactive and personalized learning experience. By using a game to deliver content, students were able to engage with the material in a way that was both enjoyable and educational, leading to improved performance. The ability to work through problems interactively and receive immediate feedback likely contributed to the positive learning outcomes observed in the case study. Moreover, the collaborative nature of the game fostered peer-to-peer learning and encouraged students to share their knowledge and strategies with each other, further enhancing the learning experience.

These results highlight the broader implications of incorporating GBL into the curriculum. When applied effectively, GBL not only enhances academic performance but also helps students develop a more positive relationship with learning, particularly in subjects that may otherwise be perceived as difficult (Daud et al., 2025; Doğan et al., 2025; Hsieh & Yeh, 2025; Montel et al., 2025; Szilágyi et al., 2025). The findings suggest that GBL can create an environment where students feel motivated, confident, and capable of succeeding, making learning more engaging, enjoyable, and meaningful. These insights provide valuable recommendations for educators looking to integrate game-based learning into their classrooms to promote deeper learning and greater student achievement.

The results of this study highlight the positive impact of game-based learning (GBL) approaches on student performance, engagement, and motivation in Brazilian schools. The experimental group, which engaged with educational games, showed a significant improvement in academic performance, with an average increase of 22% in post-test scores compared to just a 6% improvement in the control group (Arztmann et al., 2025; Elyasi et al., 2025; Hamadneh et al., 2025; Marcos et al., 2025; Olsen & Hutson, 2025; Sharma et al., 2025). Qualitative data from student interviews and teacher feedback further emphasized the increased engagement and satisfaction in the experimental group. Students reported feeling more motivated and involved in lessons, and teachers observed greater participation and enthusiasm in the classroom. These findings suggest that GBL can offer a more dynamic, interactive, and effective way of learning compared to traditional teaching methods.

These findings are consistent with the growing body of research that supports the benefits of game-based learning in enhancing student engagement and academic outcomes. Studies by Gee (2003) and Anderson & Dill (2000) have highlighted the potential of games to foster intrinsic motivation, improve problem-solving skills, and promote active learning. (Alsheikhy et al., 2025; Lakhonmoon et al., 2025; Maliki et al., 2025; Szulc et al., 2025) However, this study differentiates itself by focusing on the specific context of Brazilian schools, where socio-economic challenges, internet access, and technological disparities can impact the effectiveness of educational strategies. While similar studies have been conducted in more developed countries, this research provides new insights into how GBL can be implemented and adapted to meet the diverse needs of students in Brazil, including those from underprivileged backgrounds.

In comparison to previous studies, this research provides a unique perspective on the barriers and opportunities for integrating GBL in developing educational contexts. The success of GBL in Brazilian schools, especially in rural and economically disadvantaged areas, demonstrates that with the right resources and implementation strategies, technology can be an effective tool for overcoming educational inequalities. This contrasts with some studies that have highlighted the challenges of GBL implementation in under-resourced environments, suggesting that Brazil's growing focus on digital education infrastructure may provide the necessary support for GBL to thrive in such settings.

The findings from this study indicate that GBL can serve as a valuable pedagogical tool to address some of the longstanding issues faced by Brazilian education, such as student disengagement, lack of motivation, and insufficient access to interactive learning experiences. The significant improvement in student performance and engagement in the experimental group suggests that incorporating GBL strategies into the curriculum can lead to more dynamic and effective learning environments. This result is a strong indicator that GBL not only enhances knowledge retention but also positively impacts the overall learning experience by making it more interactive and enjoyable for students.

These results also point to the potential of GBL in promoting equity in education. By offering an interactive and engaging approach to learning, GBL can help bridge the gap between students from different socio-economic backgrounds (Annuar & Solihatin, 2025; Fadrigon et al., 2025; Kalinkara, 2025; Kärki et al., 2025). For students in rural or underserved schools, where traditional education methods may fall short, GBL provides an alternative means to engage with complex concepts and enhances their understanding of various subjects. The positive impact of GBL on engagement and academic performance signals that it can be an effective strategy to improve educational outcomes in Brazil, where disparities in access to quality education remain prevalent.

The implications of these findings are significant for educational policy and practice in Brazil. Game-based learning has the potential to transform the educational experience by making learning more engaging, interactive, and accessible. This study underscores the importance of incorporating innovative teaching methods, like GBL, into the curriculum to cater to the diverse learning styles and needs of students. Educational policymakers and school administrators should consider integrating GBL into classrooms, especially in underprivileged areas, where traditional methods may not be as effective. The results also emphasize the need for teacher training and the development of GBL resources that align with the national curriculum to ensure its successful implementation across schools.

The positive impact of GBL on student motivation and performance suggests that game-based strategies can contribute to greater student involvement and achievement. This is particularly

relevant for subjects such as mathematics and science, which often present challenges for students. Schools in Brazil can benefit from adopting GBL to foster a more engaging learning environment, promoting both academic success and student well-being. Furthermore, the potential of GBL to bridge the digital divide in Brazil indicates that with proper infrastructure and support, GBL could play a key role in reducing educational inequalities and providing equitable learning opportunities for all students.

The results can be explained by several factors. First, GBL offers an interactive and immersive experience that traditional teaching methods cannot provide. Educational games engage students by making the learning process more dynamic and enjoyable, which increases their motivation and participation in the lessons. The immediate feedback provided by GBL platforms also plays a significant role in helping students identify areas for improvement and reinforcing their understanding of the material a(Al-Hassan et al., 2025; Azevedo et al., 2025; Batdi et al., 2025; Fernández-Gómez et al., 2025). In contrast, traditional methods, which are often more passive, do not offer the same level of interaction or personalized feedback, which may explain the smaller improvements in the control group.

Additionally, the collaborative and competitive elements of many educational games foster a sense of community and peer learning, further enhancing student engagement. These aspects are particularly important in Brazilian classrooms, where social interaction and teamwork are valued components of the learning process. The use of GBL also supports different learning styles by allowing students to interact with the content in multiple ways, catering to both visual and kinesthetic learners. The combination of these factors likely contributed to the positive outcomes observed in the experimental group.

The findings of this study open several avenues for future research. First, further studies should explore the long-term impact of GBL on students' academic success and retention, particularly in subjects where students typically struggle. Longitudinal studies would provide insights into whether the positive effects of GBL are sustained over time and whether students who engage with games in early education continue to perform better in later stages. Additionally, future research should examine the scalability of GBL across various regions of Brazil, particularly in schools with limited technological resources.

Another important area for future research is the development of more tailored GBL strategies that cater to the diverse needs of Brazilian students. Customized educational games, which align with the national curriculum and address local cultural contexts, could further enhance the effectiveness of GBL. Moreover, the integration of teacher training programs focused on the use of educational games should be explored to ensure that educators are equipped to maximize the potential of GBL in their classrooms. Finally, research into the cost-effectiveness and infrastructure requirements of implementing GBL at scale in Brazil would be valuable in guiding future educational policies and initiatives aimed at making GBL accessible to all students, regardless of their socio-economic background.

CONCLUSION

The most important finding of this study is that game-based learning (GBL) significantly enhanced student engagement, motivation, and academic performance in Brazilian schools. Students in the experimental group, who used educational games, showed a 22% improvement in their post-test scores compared to just a 6% improvement in the control group. Qualitative data from student interviews and teacher feedback corroborated these findings, with students reporting

higher levels of enjoyment and interest in their lessons, and teachers noting improved participation and a more dynamic classroom environment. These results underscore the potential of GBL to address challenges related to student disengagement and provide an effective alternative to traditional teaching methods in Brazilian classrooms.

This research contributes to the literature on game-based learning by providing empirical evidence from Brazilian schools, a context that has been underrepresented in existing studies. The mixed-methods approach, combining quantitative performance data with qualitative insights from students and teachers, offers a more comprehensive understanding of how GBL can impact learning outcomes. By focusing on Brazilian schools, the study also explores how GBL can be adapted to diverse educational environments, including under-resourced schools. The findings provide valuable insights into the practical application of GBL and highlight the importance of integrating innovative teaching strategies into the national curriculum to enhance student learning experiences.

Despite the valuable insights provided, this study has several limitations. The sample size, while substantial, was limited to a few schools in Brazil, which may not fully reflect the diversity of educational environments across the country. The research also focused on short-term outcomes, assessing improvements in engagement and academic performance over a period of only a few months. Future research should address these limitations by including a larger, more diverse sample and exploring the long-term effects of GBL on student retention and academic success. Additionally, research should investigate the scalability of GBL strategies in schools with limited access to technology, especially in rural areas where infrastructure may not be as developed. Expanding the study to include a broader range of schools could provide a more comprehensive understanding of how GBL can be effectively implemented nationwide.

AUTHORS' CONTRIBUTION

Bruna Costa: Conceptualization; Project administration; Validation; Writing - review and editing.
Rafaela Lima: Conceptualization; Data curation; In-vestigation; Data curation; Investigation.
Thiago Rocha: Formal analysis; Methodology; Writing - original draft; Supervision; Validation; Other contribution; Resources; Visuali-zation; Writing - original draft.

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