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Research Article
Gamification and Learning

LEVEL UP IN TOURISM EDUCATION: UNVEILING KNOWLEDGE THROUGH THE USE OF QUIZTOUR AND TURISMO EM FORCA GAMES

LEVEL UP NO ENSINO DE TURISMO: DESVENDANDO CONHECIMENTOS COM O USO DOS GAMES QUIZTOUR E TURISMO EM FORCA

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ABSTRACT

Purpose: The study aims to investigate the effectiveness of gamification in tourism education, addressing how game elements can enhance student engagement and learning.

Methodology/Approach: The study adopted a mixed approach, starting with a systematic literature review, which provided a qualitative foundation to identify theoretical gaps and guide the development of two educational games, "QuizTour" and "Turismo em Forca." Subsequently, a pilot study was conducted with master's students in Tourism to assess the effectiveness of the games. Data collection included a survey for quantitative analysis of participants' perceptions.

Originality/Relevance: Companies have benefited from the increased productivity enabled by technologies, leading to the emergence of new products and services based on technological innovations and information systems.

Main Findings: This study advances the science in the field of education by demonstrating the effectiveness of gamification and its practical implications.

Theoretical/Methodological Contributions: Contributions include improvements in pedagogical practices and insights for implementing gamification in educational contexts, as well as strengthening the theoretical foundation on the subject.

Keywords: Gamification, Education, Tourism, Learning, Pedagogical Games.

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RESUMO

Objetivo: O estudo tem como objetivo investigar a eficácia da gamificação no ensino de turismo, abordando a questão de como elementos de jogos podem melhorar o engajamento e a aprendizagem dos alunos.

Metodologia/abordagem: O estudo adotou uma abordagem mista, iniciando com uma revisão sistemática de literatura, que forneceu uma base qualitativa para identificar lacunas teóricas e orientar o desenvolvimento de dois jogos pedagógicos, "QuizTour" e "Turismo em Forca". Posteriormente, foi realizado um estudo piloto com mestrandos em Turismo para avaliar a eficácia dos jogos. A coleta de dados incluiu um survey para análise quantitativa das percepções dos participantes.

Originalidade/Relevância: As empresas têm se beneficiado do aumento da produtividade proporcionado pelas tecnologias, o que resultou no surgimento de novos produtos e serviços baseados em inovações tecnológicas e sistemas de informação.

Principais conclusões: Este estudo avança a ciência na área de educação ao demonstrar a eficácia da gamificação e suas implicações práticas.

Contribuições teóricas/metodológicas: As contribuições incluem melhorias na prática pedagógica e *insights* para a implementação de gamificação em contextos educacionais, além de fortalecer a base teórica sobre o tema.

Palavras-chave: Gamificação, Ensino, Turismo, Aprendizagem, Educação, Jogos Pedagógicos.

1 INTRODUCTION

Gamification, defined as the application of game design elements in non-game contexts, continues to solidify as an innovative strategy in the educational field (Deterding et al., 2011). This approach has proven effective in increasing student motivation and engagement, transforming traditional learning tasks into more dynamic and interactive experiences. Recent studies emphasize that gamification can significantly enhance teaching effectiveness, fostering active and participatory learning while developing essential social and cognitive skills for students (Sailer & Homner, 2020; Seaborn & Fels, 2021).

In the context of Tourism education, gamification appears as a particularly relevant tool. Tourism, being a multidisciplinary and practical field, requires teaching methods that go beyond the simple transmission of theoretical knowledge, also necessitating the development of practical skills and an understanding of real-world scenarios in the sector (Leung, Law, van Hoof, & Buhalis, 2013). Recent research highlights that the application of gamified strategies can create learning environments that simulate real industry situations, helping students develop practical skills and apply knowledge in a contextualized manner (Strobel et al., 2022; Cahyani et al., 2023).

The primary objective of this research is to investigate innovation in Tourism education through the application of gamification, using a systematic literature review to support the development and evaluation of two educational games: *QuizTour* and *Turismo em Forca*. *QuizTour* is a question-and-answer game in which students earn points for correctly answering questions, while *Turismo em Forca* is a gamified version of the traditional hangman game, where students complete Tourism-related words based on provided hints. Both games were developed in Python during this study, with the goal of making learning more engaging.

The specific objectives of this research are: (1) to identify the main elements of gamification used in teaching through a systematic literature review; (2) to develop two interactive games based on the information found in the systematic review; (3) to implement a pilot study to assess the effectiveness of the games in the classroom context; and (4) to analyze the evaluation results to assess the potential of the games and gamification in Tourism education.

The central question guiding this research is: can gamification, through educational games, improve student learning in Tourism courses? Specifically, does the use of *QuizTour* and *Turismo em Forca* facilitate students' assimilation of Tourism content?

With this research, it aims to contribute to the discussion on the advantages and challenges of gamification in higher education, particularly in the field of Tourism. The implementation and evaluation of the *QuizTour* and *Turismo em Forca* games provided valuable insights into how these tools can enrich the educational process, promoting a more active and meaningful learning experience.

2 THEORETICAL FRAMEWORK

Gamification is an educational strategy that uses game elements and mechanics in non-game contexts to engage and motivate participants (Cavalcante et al., 2022; Cymrot & Lopes, 2023). This concept has gained significant attention in contemporary education, transforming the traditional teaching and learning dynamic by incorporating elements such as points, badges, levels, challenges, and rankings (Cruz et al., 2022; Pugliero Coelho et al., 2022).

According to Ferreira and de Figueiredo (2022), gamification aims to increase students' intrinsic motivation by providing immediate feedback and recognizing individual achievements. These elements are designed to promote active student participation and improve the learning experience, making the educational process more dynamic and engaging.

Additionally, Pugliero Coelho et al. (2022) emphasize that gamification not only seeks to enhance students' motivation through tangible and intangible incentives but also fosters more active and participatory learning. This methodology is grounded in the theory that applying game elements can create a more attractive learning environment, where students are challenged to solve problems, collaborate, and develop practical skills in a contextualized manner.

The application of gamification in education transcends basic education, being widely explored in specialized contexts, such as higher education and technical and scientific disciplines. Lima et al. (2022) demonstrated how the use of board games as an educational tool in pharmacology not only increased student engagement but also improved their ability to apply pharmacological theories in clinical practice. This type of approach not only motivates students to actively engage with content but also strengthens their critical and analytical skills (Lima et al., 2022). Cymrot and Lopes (2023), in turn, investigated the use of gamification in teaching statistics to Production Engineering students, highlighting how gamified activities can transform students' perceptions of the subject while promoting greater interaction and involvement in the learning process.

Martins and Tinti (2022) expand the discussion by examining the use of gamification in teaching mathematics. They argue that gamification not only motivates students to actively participate in activities but also facilitates the understanding of abstract concepts by contextualizing them in challenges and familiar contexts for students. Cavalcante et al. (2022) conducted a systematic literature review on gamification in higher education, focusing on administrative and accounting sciences. The study identified various practices and benefits associated with implementing this educational strategy, especially regarding student motivation and engagement, as well as promoting collaborative and multidimensional learning aligned with the current corporate environment.

Gamification has emerged as a promising strategy to transform the educational experience in higher education, offering new approaches to engage students and promote more effective and motivating learning. According to Deterding et al. (2011), gamification applies game design elements in non-game contexts, creating an interactive and dynamic environment that stimulates intrinsic motivation and student engagement. In the educational context, this approach has proven effective in promoting active student participation and optimizing the learning process (Ferreira & de Figueiredo, 2022).

This methodology consists of applying game elements and mechanics in non-game contexts, aiming to stimulate student involvement through challenges, rewards, competition, and collaboration (Cavalcante et al., 2022). One of the main benefits of gamification in higher education is its ability to motivate students both intrinsically and extrinsically, providing a dynamic and engaging learning environment. Hamari et al. (2014) point out that when well implemented, gamification significantly increases student motivation, both through internal rewards such as personal satisfaction and external rewards such as points and badges.

Studies such as Cruz et al. (2022) highlight that this approach not only increases students' interest in subjects but also significantly improves knowledge retention by making the learning process more interactive and personalized. According to Werbach and Hunter (2012), the use of game mechanics in education personalizes the learning experience by adapting challenges and rewards to each student's pace and learning style, resulting in better retention and understanding of content.

Moreover, gamification has been successfully applied in technical and vocational courses, where greater student participation in practical and simulated activities is observed. According to Kapp (2012), gamification is especially

effective in technical teaching environments as it facilitates the practical application of theoretical knowledge and increases engagement in simulated activities, promoting deeper and more lasting learning. Espíndola (2022) discusses how gamification can be used to improve teachers' perception of student engagement in technical schools, creating a more stimulating learning environment adapted to students' needs.

In the context of administrative and accounting sciences, gamification has been explored as a way to better prepare students for the job market by promoting skills such as teamwork, decision-making, and solving complex problems (Cavalcante et al., 2022). Another important aspect of gamification applications in higher education is its ability to personalize learning according to students' individual preferences and styles. According to Anderson et al. (2020), personalizing learning through gamification allows students with different learning styles, including those with special needs, to benefit from a more inclusive and accessible educational process. Pugliero Coelho et al. (2022) discuss how this approach can be adapted to meet the specific needs of students with disabilities or learning difficulties, offering an inclusive and accessible environment for all participants.

In summary, the applications of gamification in higher education represent a significant innovation in contemporary education, providing new ways to engage students and improve learning outcomes. This method not only promotes student motivation and interest but also better prepares future professionals by developing essential skills for academic and professional success, in addition to promoting more effective and meaningful learning (Deterding et al., 2011; Hamari et al., 2014). This article reinforces the importance of understanding the theoretical foundations of gamification and exploring its practical applications to optimize teaching and learning processes in different contexts.

3 METHODOLOGY

To achieve the outlined objectives, this article adopted a methodology divided into two main stages: (1) a systematic literature review following the PRISMA protocol (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), and (2) the structuring, development, application, and evaluation of two games focused on teaching in the Tourism area.

In the first stage, the systematic review was chosen due to its ability to provide a rigorous and transparent approach to synthesizing the existing evidence on a specific topic (Kitchenham, 2004; Petticrew & Roberts, 2006). According to Tranfield, Denyer, and Smart (2003), this approach minimizes bias in the selection of studies and provides a detailed and objective analysis of the available evidence. Thus, the systematic review is widely used to generate a robust theoretical foundation for empirical studies, allowing researchers to develop a clearer view of the gaps in existing knowledge (Briner & Denyer, 2012). The PRISMA protocol, as discussed by Moher et al. (2009), establishes clear guidelines for conducting and reporting systematic reviews, ensuring transparency and replicability of the processes. The PRISMA protocol includes essential steps, such as defining the research question, formulating inclusion and exclusion criteria, developing the search strategy, selecting studies, and synthesizing results (Liberati et al., 2009). The application of this protocol strengthens the internal validity of the review by reducing biases and increasing the clarity of the search and data analysis process (Page et al., 2021). Figure 1 below illustrates the application of the PRISMA protocol to the present research.

Figure 1. PRISMA Protocol

[Identification]
Articles found with the STRING: 732
[Selection]
Filter by year (2022-2024): 299
[Evaluation]
Peer review: 122
[Synthesis]
National productions: 99
[Analysis]
Filter by Applied Social Sciences: 29

Source: Authors (2024)

In this study, the systematic review was conducted in June 2024 using the CAPES Portal, an important platform for accessing scientific databases. The search strategy included the following string: ("gamification" OR "gamificação") AND ("ensino" OR "educação" OR "education" OR "teaching") AND ("sala de aula" OR "escola" OR "universidade" OR "classroom" OR "school" OR "university"), resulting in 732 articles. After applying inclusion criteria such as publication period (2022-2024), peer review, and focus on national productions in the field of Applied Social Sciences, 29 articles were selected for detailed analysis. The systematic review allows for the identification of patterns, successful practices, and areas that require further investigation (Gough, Oliver & Thomas, 2017), highlighting both the benefits and challenges of gamification in education (Deterding et al., 2011).

3.1. Pilot Study

The pilot study phase involved the development and application of two educational games, based on the gaps and insights identified in the systematic literature review. To test the effectiveness of gamification as a pedagogical tool, a pilot study was conducted in June 2024, with a Master's class in Innovation and Tourism, part of the Programa de Pós-Graduação em Hotelaria e Turismo (PPHTur) at the Universidade Federal de Pernambuco (UFPE). The sample consisted of 14 students from the course, coming from different fields of knowledge, who were divided into two groups of 7 students. Each group was guided by one of the authors of this study.

It is noteworthy that pilot studies are essential for testing the feasibility and effectiveness of a research project on a small sample before its application to a larger one (Leon, Davis & Kraemer, 2011). They allow for the adjustment of planning and data collection instruments, ensuring these tools are appropriate for the target audience and minimizing methodological issues that may arise during the main research (van Teijlingen & Hundley, 2001). This preliminary validation process can also be seen as a way to enhance the reliability and validity of the methods employed (Thabane et al., 2010; Connelly, 2008).

The pilot study dynamic followed this format: initially, one group played the first game while the other played the second. After completing the first game, the groups switched, ensuring that all participants had the opportunity to interact with both games. This alternation format was chosen to avoid bias between the groups and ensure that all students had a comparable experience with the two gamification tools.

For data collection, a survey was created using Google Forms, which was sent to the students who participated in the game applications. Field research allows for testing the practical applicability of theories and identifying the direct impact of pedagogical interventions (Creswell, 2018). Moreover, analyzing the data obtained through the survey enables a robust assessment of the effectiveness of gamification in the educational context (Robson & McCartan, 2016), allowing for a deeper understanding of how this approach can be used to improve student engagement and academic performance.

The participants were informed about the research objectives and instructed on the use of the applications, following the ethical principles recommended for pilot studies, such as obtaining informed consent. Research ethics involves the responsible treatment of data and the protection of participants' rights (Resnik, 2020), ensuring that the information is obtained and used appropriately. Informed consent is a key aspect of this process, allowing participants to fully understand the study’s objectives and the potential risks involved (Dresser, 2012). This transparency helps build trust and avoids ethical complications during the research.

During the game sessions, the students, divided into groups, used computers to interact with the apps *QuizTour* and *Turismo em Forca* at different times to mitigate cross-influences between the games. The separation of activities contributed to reducing the order bias, as described by Creswell (2018), allowing for a more objective evaluation of the effects of each game on learning.

In the *QuizTour* game, the pedagogical objective was to promote an understanding of fundamental tourism concepts, using questions and answers involving themes like tourist destinations, culture, and geography. Gamification was explored through competitive elements, such as the scoreboards and level progression, encouraging active participation and engagement. On the other hand, the *Turismo em Forca* game was designed to reinforce tourism vocabulary and concepts in a playful way, with the goal of improving students’ memory and contextual knowledge of the field. Gamification elements, such as time limits and restricted attempts, were incorporated to create challenges that stimulated quick thinking and strategic reasoning.

After the sessions, an evaluation form with seven closed questions was applied, covering topics like usability, content relevance, learning impact, and the recommendation of the games to other students. Data collection in pilot

studies, as Hertzog (2008) emphasizes, is essential to test the clarity and accuracy of research instruments, as well as to validate their applicability in a broader context.

The data analysis was conducted using quantitative data, with responses categorized and tabulated for descriptive statistical analysis. According to Kim (2011), quantitative analysis in pilot studies provides an initial insight into the effectiveness of the methods and tools used, as well as offering guidance for adjustments in the research design. The use of quantitative analysis is widely advocated in preliminary studies as it provides a solid foundation for methodological decisions and helps identify trends that can be explored in the main research (Tashakkori & Teddlie, 2010).

4 RESULTS AND DISCUSSIONS

The research results present the main findings from the systematic literature review process, the development of games using Python in higher education, the identified opportunities and theoretical gaps, as well as the results from the application and evaluations of the *QuizTour* and *Turismo em Forca* games.

4.1. Results from the Systematic Literature Review

After conducting the systematic literature analysis, it was found that gamification stands out as an innovative strategy in the educational environment, offering both significant benefits and challenges, as well as the potential to transform the teaching-learning process by incorporating game elements into educational contexts. Studies such as those by Ferreira and Figueiredo (2022) show that the use of rewards, competitions, and narratives makes learning more dynamic and engaging, facilitating the understanding of complex concepts.

The analysis also revealed that gamification promotes collaborative learning, where healthy competition and teamwork are encouraged, resulting in the development of fundamental social skills, such as effective communication and cooperation (Nicoletti et al., 2022). Another positive aspect identified was the personalization of learning, which allows students to progress at their own pace, adapting challenges according to their needs (Martins & Tinti, 2022).

However, the results also highlighted significant challenges. The implementation of gamification requires carefully planned design that remains relevant and motivating over time. Additionally, the lack of technological resources and institutional support can hinder the adoption of this approach in some institutions (Pugliero Coelho et al., 2022). Issues related to equity and inclusion also arise, demanding that gamified activities be accessible and suitable for different learning styles and individual needs.

Thus, the results indicate that, while gamification brings significant benefits to education, its effective implementation depends on overcoming these challenges. A joint effort between educators, institutions, and developers is necessary to ensure that gamified strategies are inclusive, accessible, and effective for all students.

4.2 Development of Games with Python in Higher Education: Opportunities and Theoretical Gaps

The systematic literature analysis also revealed significant opportunities and theoretical gaps to be explored in the development of games using the Python programming language in higher education. This approach, in addition to being innovative, offers both benefits and challenges in enriching the teaching-learning process. The use of Python not only facilitates teaching programming concepts in a practical and applied manner but also promotes the development of critical skills, such as problem-solving and creativity among students (Lima et al., 2022).

Among the theoretical gaps identified, there is a growing need for educational methods that, in addition to engaging students, prepare them for the challenges of the contemporary job market. The use of Python in the development of educational games is supported by insights like those of Ferreira and Figueiredo (2022), who argue that the practical application of theoretical concepts, through concrete projects, not only strengthens students' understanding but also motivates them, demonstrating the practical impact of the skills acquired.

Additionally, the literature emphasized the importance of personalizing learning to meet students' individual needs. The flexibility provided by the use of Python allows educational games to be adapted according to students' skill levels and preferences, resulting in a more effective and personalized learning experience (Martins & Tinti, 2022). This

accessibility is enhanced by the simplicity and readability of Python, which makes it easier to include students from diverse academic backgrounds, promoting a more inclusive educational environment (Pugliero Coelho et al., 2022).

However, the results indicate that, to fully harness the potential of game programming with Python, challenges such as adequate teacher training and institutional support need to be overcome. The effective implementation of this technology depends on investments in resources and training, ensuring that educators can fully utilize this innovative approach (Cavalcante et al., 2022).

Therefore, the development of games with Python in higher education presents a promising opportunity to address theoretical gaps through the practical application of academic concepts. Adopting this methodology can not only increase student engagement but also better prepare them for the challenges of the globalized and digital job market.

4.3 Results of the Application and Evaluation of the *QuizTour* and *Turismo em Forca* Games

The systematic literature analysis revealed significant opportunities and theoretical gaps to be explored in the development of games using the Python programming language in higher education. This approach, in addition to being innovative, offers both benefits and challenges in enriching the teaching-learning process. The use of Python not only facilitates teaching programming concepts in a practical and applied manner, but also promotes the development of critical skills, such as problem-solving and creativity among students (Lima et al., 2022).

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Additionally, the literature emphasized the importance of personalizing learning to meet students' individual needs. The flexibility provided by the use of Python allows educational games to be adapted according to students' skill levels and preferences, resulting in a more effective and personalized learning experience (Martins & Tinti, 2022). This accessibility is enhanced by the simplicity and readability of the Python language, which facilitates the inclusion of students from diverse academic backgrounds and promotes a more inclusive educational environment (Pugliero Coelho et al., 2022).

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Therefore, the development of games with Python in higher education presents a promising opportunity to address theoretical gaps through the practical application of academic concepts. The adoption of this methodology can not only increase student engagement but also better prepare them for the challenges of the globalized and digital job market.

5 FINAL CONSIDERATIONS

The results obtained with the implementation of *QuizTour*, an interactive game developed in Python, demonstrated that gamification can be an effective tool in the teaching of Tourism. The evaluation of the students indicated that the game not only facilitated the understanding of the covered content but also increased motivation and engagement. Most participants found the game interface intuitive, and the learning experience fun and relevant.

The main contribution of this research to science and academic studies lies in proving that gamifying the teaching and learning process is an active methodology capable of increasing engagement and learning, making lessons more dynamic and appealing, as well as increasing students' interest in the content.

Additionally, the inclusion of the *Turismo em Forca* game further expands the possibilities of applying gamification in the teaching of Tourism. This second app provides a complementary approach to *QuizTour*, offering students a varied and dynamic learning experience. Although simple, the hangman game presents distinct challenges and opportunities for students to apply and reinforce their knowledge in a playful and interactive environment.

However, this study presents some limitations that should be considered. Firstly, during the first methodological stage, which focused on the systematic literature review, attempts were initially made to apply strings that included the area of Tourism as one of its keywords. However, no significant results were obtained with these restrictions, which led

to filtering the review to studies in the field of social sciences as a whole. Secondly, regarding the application of the games, the sample used was relatively small and restricted to a single class of students, which may limit the generalization of the results. Additionally, the evaluation was mainly based on students' perceptions, without an in-depth analysis of objective academic performance metrics. Another significant limitation is the simplicity of the games. Due to the authors' limited knowledge in Python and programming languages, both *QuizTour* and *Turismo em Forca* are simple games with low complexity.

For future studies, it is suggested that research be conducted with larger and more diverse samples, including different educational institutions and education levels. It would also be interesting to explore other forms of educational games and compare their effectiveness with *QuizTour* and *Turismo em Forca*. Furthermore, integrating objective performance evaluations, such as pre- and post-game tests, could provide a more complete view of the impact of gamification on learning. It is also recommended that more complex and well-designed games be developed, challenging students at different levels of skill and knowledge, thus expanding the benefits of gamification in the teaching of Tourism.

It is worth noting that both *QuizTour* and *Turismo em Forca* proved to be promising tools in the teaching of Tourism, indicating that gamification can be a valid and effective approach to enriching the educational experience and promoting more engaging and meaningful learning.

REFERENCES]

Anderson, C., et al. (2020). Personalization in education through gamification: An inclusive approach. *Educational Technology Research and Development*, 68(4), 865-884. https://doi.org/10.1007/s11423-020-09792-1

Bragé, D., Hank Miri, D., Folchini da Costa, L., Silva Grabowski, B., & Kaiser Bragé, D. (2022). Treinamento e desenvolvimento com foco na gamificação: Visão do processo a partir das consultorias brasileiras. *Revista de Carreiras e Pessoas (ReCaPe)*, 12, 28-47.

Briner, R. B., & Denyer, D. (2012). Systematic review and evidence synthesis as a practice and scholarship tool. *Handbook of Evidence-Based Management*, 112-129.

Brito, L. M., & Alencar, C. E. R. D. (2023). Monitoria de introdução à sistemática biológica: Relatos e reflexões. *Bio-grafía*, *16*(31), 86-99. https://doi.org/10.17227/bio-grafia.vol.16.num31-19851

Cahyani, A. D., Sugiarto, B., & Nugraha, T. Y. (2023). Enhancing tourism education through gamified simulation learning. *Tourism Management Perspectives*, *45*, 101045. https://doi.org/10.1016/j.tmp.2023.101045

Campos, K., Moraes, D. A. F. de, & Méllo, D. E. de. (2022). A gamificação como alternativa didática na aprendizagem de conceitos matemáticos nos anos iniciais durante a pandemia da COVID-19. *EaD em Foco*, *12*(2), e1904. https://doi.org/10.18264/eadf.v12i2.1904

Carrazzoni dos Santos, G., & Carpes, P. P. G. (2022). Ensino superior e a disciplina de bases matemáticas: Possibilidades via o ensino híbrido. *REMAT: Revista Eletrônica da Matemática*, *8*(2), e2002. https://doi.org/10.35819/remat2022v8i2id5654

Cavalcante, V. F. do R., Reinaldi, M. A. de A., & Giordani, A. T. (2022). Systematic review of literature on gamification in higher education in administration and accounting sciences. *Research, Society and Development*, *11*(10), e590111032277. https://doi.org/10.33448/rsd-v11i10.32277

Connelly, L. M. (2008). Pilot studies. *MedSurg Nursing*, *17*(6), 411-412.

Creswell, J. W. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Cruz, I. S., Anjos, B. G. dos, & Duarte, A. C. S. (2022). Sequência didática: Gamificação como estratégia para o ensino de evolução humana no âmbito do PIBID. *Diversitas Journal*, *7*(3), e2213. https://doi.org/10.48017/dj.v7i3.2213

Cymrot, R., & Lopes, A. L. de S. (2023). Proposta do uso de uma atividade de gamificação nas aulas de estatística no curso de engenharia de produção e a percepção dos alunos sobre esta atividade. *Revista Produção Online*, *23*(1), e4284. https://doi.org/10.14488/1676-1901.v23i1.4284

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification". In *Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments* (pp. 9-15).

Dresser, R. (2012). The ubiquity and utility of the concept of informed consent. *The Journal of Clinical Ethics*, *23*(4), 303-311.

Duarte Farias, G., Bezerra Soares, J., Ribeiro de Sena, J., Barbosa Sousa de Lucena, L., de Sousa, E. M. D., & Emiliano Batista Paiva, M. D. (2023). LET'S GO! ANATOMY GAME: Uma metodologia ativa para o aprimoramento do ensino da anatomia. *Arquivos de Mudi*, *27*(2), 111-123. Disponível em https://periodicos.uem.br/ojs/index.php/ArqMudi/article/view/68905

Elias Santos Alencar, N., Pinto, M. A. O., Leite, N. T., & da Silva, C. M. V. (2023). Construção e validação de jogo educativo sobre sexualidade para adolescentes. *Revista Cuidarte*, *14*(1), e2354. https://doi.org/10.15649/cuidarte.2354

Espíndola, M. A. (2022). Uso da gamificação no ensino técnico: Estudo sobre a percepção de docentes de uma escola de ensino técnico-profissional de Divinópolis-MG. *Educação, Ciência e Cultura*, *27*, 103-118.

Ferreira, A. S., & de Figueiredo, L. F. G. (2022). Ludificação e gamificação: Divergências e convergências sob a perspectiva de gestão de design sistêmica e de educação. *Projetica*, *14*(1), 1-30. https://doi.org/10.5433/2236-2207.2023.v14.n1.43868

Gough, D., Oliver, S., & Thomas, J. (2017). *An introduction to systematic reviews*. Sage.

Gamificação no ensino fundamental: Metodologia ativa na perspectiva da educação inclusiva e da valorização das potencialidades de todos os estudantes. (2023). *Eventos Pedagógicos*, *14*(2), 424-442. https://doi.org/10.30681/reps.v14i2.10580

Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work?--a literature review of empirical studies on gamification. In *2014 47th Hawaii International Conference on System Sciences* (pp. 3025-3034). IEEE.

Hertzog, M. A. (2008). Considerations in determining sample size for pilot studies. *Research in Nursing & Health*, 31(2), 180-191. https://doi.org/10.1002/nur.20247

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

Kitchenham, B. (2004). Procedures for performing systematic reviews. *Keele, UK, Keele University*.

Kim, Y. (2011). Pilot study in qualitative research: The roles and values. *Qualitative Research Journal*, 11(2), 199-206. https://doi.org/10.3316/QRJ1102199

Leon, A. C., Davis, L. L., & Kraemer, H. C. (2011). The role and interpretation of pilot studies in clinical research. *Journal of Psychiatric Research*, 45(5), 626-629. https://doi.org/10.1016/j.jpsychires.2010.10.008

Leung, D., Law, R., van Hoof, H., & Buhalis, D. (2013). Social media in tourism and hospitality: A literature review. *Journal of Travel & Tourism Marketing*, *30*(1-2), 3-22.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., ... & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *PLoS Med*, *6*(7), e1000100.

Lima, G. S., Gomes, R. de O., Santana Júnior, J. C. V., Ferro, J. M. R. B. dos S., Sampaio, G. R., & Soares, D. de M. (2022). A board game as an educational tool to teach pharmacology for pharmacy students. *Research, Society and Development*, *11*(5), e28421. https://doi.org/10.33448/rsd-v11i5.28421

Lima, L. A., Sousa, F. J. F. de, Mistura, C., Martins, S. N., & Del Pino, J. C. (2022). Gamification and the teaching process: Proposed questions to teaching mathematics. *Research, Society and Development*, *11*(1), e24613. https://doi.org/10.33448/rsd-v11i1.24613

Martins, A. C., & Tinti, D. D. S. (2022). Levantamento das produções acerca do uso da gamificação nos processos de ensino e aprendizagem de matemática: Um olhar para a formação de professores que ensinam matemática. *Educação Matemática em Revista*, *27*, 84-105.

Martins Brito e Silva, L., & Rocha Duarte Alencar, C. E. (2023). Monitoria de introdução à sistemática biológica: Relatos e reflexões. *Bio-grafía*, *16*(31), 86-99. https://doi.org/10.17227/bio-grafia.vol.16.num31-19851

Mercês Freitas, D., & Toda, A. (2023). A gamificação como apoio no ensino de metodologia científica: Um relato de experiência e lições aprendidas no domínio de ciências agrárias. *Revista Novas Tecnologias Na Educação*, *20*(2), 125-134. https://doi.org/10.22456/1679-1916.129159

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med*, *6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Nicoletti, A. M., Loro, V. L., & Corrêa, G. C. (2022). Use of gamification through the "Pass-Pass" game: An experience with general biochemistry students. *Research, Society and Development*, *11*(17), e38910. https://doi.org/10.33448/rsd-v11i17.38910

Nunes, K. L. X., & Grossi, L. (2023). Tecnologias digitais em educação matemática: Panorama dos grupos de pesquisa do Paraná. *REMATEC*, *18*(43), e2023003. https://doi.org/10.37084/REMATEC.1980-3141.2023.n43.pe2023003.id431

Olivares, G. L., Passalini, A. A., & Azevedo Filho, E. (2023). Simulador de processos produtivos – Praxis: Aplicação do método integrativo como recurso de aprendizagem de conceitos de gestão por processos organizacionais. *Revista Produção Online*, *23*(2), e4975. https://doi.org/10.14488/1676-1901.v23i2.4975

Padilha, R., & Webber, C. (2022). Explorando a gamificação na formação docente com o software GeoGebra. *Revista Brasileira De Ensino De Ciências E Matemática*, 5(especial), e12867. https://doi.org/10.5335/rbecm.v5iespecial.12867

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The

PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, *372*, n71.

Petticrew, M., & Roberts, H. (2006). *Systematic reviews in the social sciences: A practical guide*. Blackwell Publishing.

Pugliero Coelho, C., Godinho Soares, R., do Amaral Gonçalves, N. S., & Roehrs, R. (2022). Gamificação e educação especial inclusiva: uma revisão sistemática de literatura. *Revista Pedagógica*, 24(1), 1-23. https://doi.org/10.22196/rp.v24i1.6971

Reinaldi, M. A. de A., Romanowski, J. P., & Santos, R. O. (2022). Theoretical mapping of gamification in higher education in accounting as a theme of research in graduate programs. *Research, Society and Development*, 11(11), e34055. https://doi.org/10.33448/rsd-v11i11.34055

Reinaldi, M. A. de A., & Santos, R. O. dos. (2022). Training needs of teachers for the use of game elements in higher education of accounting sciences. *Research, Society and Development*, 11(6), e44511629510. https://doi.org/10.33448/rsd-v11i6.29510

Resnik, D. B. (2020). *The ethics of research with human subjects: Protecting people, advancing science, promoting trust*. Springer Nature.

Robson, C., & McCartan, K. (2016). *Real world research*. Wiley.

Sailer, M., & Homner, L. (2020). The gamification of learning: A meta-analysis. *Educational Psychology Review, 32*(1), 77-112. https://doi.org/10.1007/s10648-019-09498-w

Santana, E. B., Torres, M. M., Gonçalves, E. H., Peralta, C. B. da L., & Ferreira, E. P. (2023). Active learning: Development of a didactic game to understand and apply the standardization tool. *Revista Produção Online*, 23(1), 4961. https://doi.org/10.14488/1676-1901.v23i1.4961

Santos, D. P. G., Rocha, L. O., & Santos, T. M. (2022). Impacts of gamification adoption on students' performance in Mathematics discipline. *Research, Society and Development*, 11(15), e141111536628. https://doi.org/10.33448/rsd-v11i15.36628

Seaborn, K., & Fels, D. I. (2021). Gamification and motivation in education: A systematic review. *Computers in Human Behavior, 124*, 106903. https://doi.org/10.1016/j.chb.2021.106903

Signori, G. G., Guimarães, J. C. F. D., Severo, E. A., & Rotta, C. (2018). Gamification as an innovative method in the processes of learning in higher education institutions. *International Journal of Innovation and Learning*, 24(2), 115-137. https://doi.org/10.1504/IJIL.2018.094066

Scortegagna, L., & Bruno, A. R. (2022). e-Val: A prototype for analysis and evaluation of interactivity levels in digital items. *Pesquisa e Debate em Educação*, 12(1), 1–26. https://doi.org/10.34019/2237-9444.2022.v12.36983

Silva, A. M. d. (2022). The use of the Kahoot platform as a gamification tool: A contribution to teaching and learning in basic education. *Revista EDaPECI - Educação a Distância e Práticas Educativas Comunicacionais e Interculturais*, 22. https://doi.org/10.5216/edapeci.v22.12140

Strobel, J., Simeonova, B., & Kumar, R. (2022). Gamified learning environments in tourism education: A pathway to engagement and practical skills development. *Journal of Hospitality, Leisure, Sport & Tourism Education, 31*, 100376. https://doi.org/10.1016/j.jhlste.2022.100376

Tashakkori, A., & Teddlie, C. (Eds.). (2010). *SAGE handbook of mixed methods in social & behavioral research*. Sage.

Thabane, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., ... & Goldsmith, C. H. (2010). A tutorial on pilot studies: The what, why and how. *BMC Medical Research Methodology*, 10(1), 1-10. https://doi.org/10.1186/1471-2288-10-1

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14(3), 207-222. https://doi.org/10.1111/1467-8551.00375

van Teijlingen, E., & Hundley, V. (2001). The importance of pilot studies. *Social Research Update*, 35(4), 1-4.

Villela, A. L. V., & Batistello, P. (2023). Active methodologies in teaching-learning of the formal-plastic and aesthetic composition of buildings: Reflections from the architecture and urbanism course at Unochapecó. *Revista Espaço Pedagógico*, 30, e14209. https://doi.org/10.5335/rep.v30i0.14209

Wang, F., Hannafin, M. J., & Wang, H. (2018). Gamifying learning experiences: Practical implications and outcomes. *Educational Technology Research and Development*, 66(5), 1273-1305. https://doi.org/10.1007/s11423-018-9609-9

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