Opportunities To Use Gamification For The Learning Of Autistic Students: A Systematic Review

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Abstract:
This research aimed to analyze the potential of gamification in the educational context of students with Autism Spectrum Disorder (ASD). To this end, a systematic review was carried out based on the PRISMA guidelines, searching academic platforms such as Google Scholar, Scielo and Web of Science. Keywords were used with Boolean operators to find studies on gamification in the context of autism and its benefits. The inclusion criteria required Brazilian nationality and a publication date between 2018 and 2023, excluding theses, dissertations, expanded abstracts and monographs. After an initial screening of titles and abstracts, the selected articles underwent a detailed analysis of the full texts. As a result, a sample of 7 articles was obtained, where it was possible to verify the effectiveness of gamification as a strategy to improve learning, engagement and the development of autistic students, through the integration of playful and interactive elements in teaching activities. The research underlined the relevance of gamification in promoting inclusion and valuing individuality, making teaching more effective and equal. The analysis indicated significant benefits, including improved concentration, collaborative learning and the development of autonomy, especially in the teaching of essential skills such as literacy. However, challenges were identified, such as the risk of social isolation due to excessive use of electronic devices and the need for specific resources and adaptations for children with special needs. In addition, ongoing teacher training plays a crucial role in the successful implementation of gamification.
Key Word*: Gamification; autistic students.*

I. Introduction

Gamification is a strategy that uses game elements and mechanics to engage people in non-game contexts, such as education, the workplace, healthcare and other sectors. The main aim of gamification is to motivate, involve and influence people's behavior by making tasks or activities more interesting and fun. Gamification is based on the idea that human beings have a natural predisposition towards competition, conquest, challenge and reward, and these characteristics can be harnessed to achieve various goals (COSTA et al., 2020).

In the field of education, Frazão and Nakamato (2020) point out that gamification in education is a pedagogical strategy that uses game elements and mechanics to involve students in learning activities. This approach has gained prominence in recent decades due to its potential to make the educational process more interactive, engaging and effective.

In the context of educating autistic students, gamification plays an even more significant role, since autistic students face specific challenges in the educational environment, including difficulties with communication, social interaction and intrinsic motivation. Gamification, which involves the application of gaming elements in non-playful environments, can be a powerful tool for engaging autistic students, making learning more interactive and captivating (BRAGA; SILVA; PEDROSA, 2021).

Autism, also known as Autism Spectrum Disorder (ASD), is a neuropsychiatric condition that affects brain development and the way people perceive, interact and communicate with the world around them. Autism is characterized by a wide range of challenges, ranging from mild to severe, affecting each individual in a unique way (VIANNA et al., 2020).

As Marques and Bosa (2015) point out, children with autism can have communication difficulties, such as speech delays, difficulties understanding language or using non-verbal communication. In addition, challenges in social interaction are common, with difficulties in making friends, understanding the emotions of others and taking part in interactive games. Repetitive behavior, such as stereotyped movements, fixations on behaviour patterns or specific interests, is another characteristic observed in children with ASD.

Thus, gamification in the education of autistic students has emerged as a promising approach to tackling these challenges and promoting the all-round development of these children (FRAZÃO; NAKAMATO, 2020). Given this context, this research aimed to analyze the main opportunities of using gamification for the learning of autistic students.

II. Material And Methods

As for the methodological procedures, this study was carried out under the guidance of a systematic review, which is, according to Brizola and Fantin (2016), a research method that involves the collection, selection and rigorous analysis of relevant and reliable studies available in the literature. This method enabled an approach to evaluate and synthesize the available evidence on the potential of gamification in the education of students with Autism Spectrum Disorder (ASD). The systematic review included identifying relevant studies, applying inclusion and exclusion criteria, extracting meaningful data and carefully analyzing the results, with the aim of providing an in-depth and informed understanding of the topic in question.

To this end, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines were followed, which set strict standards for conducting systematic reviews, ensuring transparency and research quality, as suggested by Galvão and Ricarte (2019). The use of the PRISMA guidelines ensured that all stages of the systematic review process were clearly and completely documented, including the drafting of the research protocol, the search for relevant studies in multiple databases, the careful selection of articles according to predefined criteria, the systematic extraction of data and the robust analysis of the results.

The search for articles took place on the scientific platforms Google Scholar, Scielo and Web of Science, covering a broad spectrum of reliable sources. This meticulous approach to the selection of research platforms aimed to ensure the inclusion of high quality and relevant studies, covering diverse perspectives and academic sources. In this way, the research was able to benefit from the diversity of information available in different databases, strengthening the soundness of the conclusions reached in the systematic review. The use of these platforms contributed to the selection of relevant studies, ensuring that the research was based on reliable research sources.

The search for articles involved using keywords in association with the Boolean operators "AND" and "OR", resulting in the following search sequence: ("gamification") and ("autism") and ("opportunities" or "benefits"). This search strategy allowed for an efficient screening of the literature, focussing on gamification in the context of autism and the opportunities or benefits associated with this educational approach. The combination of keywords and Boolean operators played an essential role in selecting studies that were directly relevant to the research topic, ensuring that the articles identified were aligned with the objectives of the systematic review.

As inclusion criteria, only articles that specifically addressed gamification in the educational context of students with Autism Spectrum Disorder (ASD) and the potential benefits or opportunities associated with this approach were considered. In addition, the studies had to be of Brazilian nationality and published between 2018 and 2023. The exclusion criteria were studies that were not directly related to the use of gamification in teaching students with ASD and studies that were not of Brazilian nationality. Theses, dissertations, expanded abstracts and monographs were also discarded.

The articles were analyzed in two stages, as suggested by De-la-Torre-Ugarte-Guanilo, Takahashi and Bertolozzi (2011). Firstly, an initial screening, including reading the titles and abstracts of the articles identified in the search. The aim of this screening was to discard studies that clearly did not meet the inclusion criteria. Next, the articles that passed the initial screening were subjected to a more in-depth analysis, in which the full text of each study was examined in detail. During this analysis, the inclusion and exclusion criteria were applied rigorously to ensure the selection of the most relevant and reliable studies, corroborating what Donato and Donato (2019) suggest.

The articles were analyzed according to the established inclusion and exclusion criteria, resulting in the selection of the studies most pertinent to the research. Data collection was carried out systematically, extracting relevant information from each article, including data on authors, year of publication, research methods, results and conclusions. As a result, a sample of 7 articles was obtained. Figure 1 shows the methodological procedures for selecting these 7 articles.

Figure 1. Systematic review processes
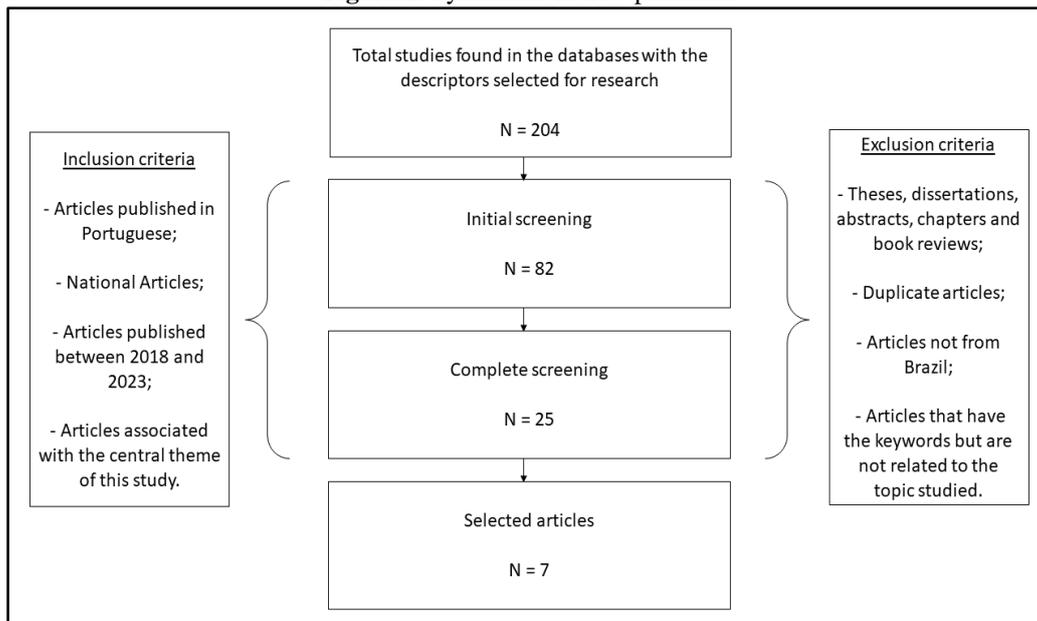
The articles were organized in a spreadsheet according to a categorisation system that enabled effective analysis and comparison of the included studies. Each article was listed in the spreadsheet along with relevant information such as author(s), title, year of publication, abstract, research objectives, methods used, main results and conclusions. This organizational structure of the spreadsheet was fundamental in facilitating the process of reviewing and synthesizing the evidence, making it clearer and more systematic to examine the main insights offered by each study.

III. Result

After the systematic review, the seven articles were summarized in a table to make it easier to understand the main findings and conclusions related to gamification in the education of students with Autism Spectrum Disorder (ASD), as shown in Table 1.

Table 1: Articles selected in the systematic review

Authors	Research objective	Research conclusions
Pereira and Barwaldt (2022)	To understand how the use of gamification can address math skills for autistic students and their engagement in using these environments.	Gamification has been shown to be effective in increasing the motivation, engagement and performance of autistic students in mathematical learning. As such, the review highlighted gamification as a promising approach to improving math teaching for students with ASD.
Pena et al. (2022)	Developing a digital game - "Letrinhas", on the Android platform, to help the learning process of children with ASD.	Gamification, as exemplified by the Letrinhas game, offers valuable learning opportunities for autistic students, stimulating cognition through activities related to everyday life and practice. However, it is crucial to consider digital inclusion and the need for supervision by a carer to control the time and frequency of use. Prolonged and exclusive use of tools like this can potentially isolate the child from socializing and damage their social interaction skills. Therefore, gamification can be an effective educational tool, as long as it is used in a balanced and conscious way.
Silva, Coelho and Godoy (2022)	To investigate the role of gamification in learning and stimulating the cognitive capacity of students with Autism Spectrum Disorder (ASD).	Gamification has been shown to offer several benefits for people with ASD, including improved concentration, attention, collaborative learning, engagement and the perception of daily routines and details that contribute to the development of autonomy.

Rodrigues and Clauss (2022)	Verify how gamification can contribute to the learning of students with autism within the educational context and investigate the effectiveness of digital games as a facilitator in the education of children and adolescents with or without disabilities.	Gamification in primary school brings benefits to autistic children, helping to develop social, cognitive and psychological skills. It arouses students' interest in learning, including autistic students, through platforms and mobile applications that are accessible outside the school environment. However, the inclusion of resources for the disabled is still limited due to little investment from media companies. The challenge is to understand the preferences of the new generation and the best form of interaction in learning. Continuous teacher training and the inclusion of these tools in degree programmes are necessary.
Santos, Lima and Santos (2021)	The aim of the study is to analyze how teachers in the early years of a public school in Maceió, AL, use gamification and digital games to teach students with Autism Spectrum Disorder (ASD). The study explored the opportunities, obstacles and challenges faced by educators when applying gamification for educational purposes.	The research highlights that gamification is a valuable strategy for teaching autistic children, as it improves their attention, behavior and learning. Although it is not widely used in school research, some teachers apply it in gamified environments at school. This is seen as an opportunity to develop students' skills, but faces challenges such as lack of planning, integration of all students and the need for ongoing training for teachers. The research also emphasizes the importance of understanding autistic students' limitations and providing support for their development.
Coelho et al. (2022)	A systematic review of the literature shows how gamification is used from an inclusive special education perspective.	Gamification is considered a promising strategy in inclusive special education. It has the potential to improve the teaching and learning process for students with disabilities, promoting inclusion in the classroom. This approach offers motivational stimuli and playful factors that can develop students' autonomy, improve engagement and encourage cooperation between them. However, the research highlights that there are few academic studies related to gamification from the perspective of inclusive special education, suggesting the need for more research and academic publications on the subject.
Silva et al. (2022)	Discuss gamification strategies in literacy for students with special educational needs in the early grades, taking into account the inclusive education approach.	Gamification stands out as a promising strategy for teaching literacy and literacy, as it can involve students, make learning meaningful and promote engagement. The use of games can be applied at any stage of the development of the writing system, from phonological reflection to the appropriation of alphabetic writing. Gamification, combined with assistive technologies, provides autonomy and inclusion for students in literacy.

Source: Research data (2023).

The systematic review provides a comprehensive overview of the potential of gamification in the educational context of students with Autism Spectrum Disorder (ASD). Pereira and Barwaldt (2022), emphasize the effectiveness of gamification as a strategy to promote mathematical learning in autistic students. The authors suggest that gamification not only increases the motivation of autistic students, but also boosts their engagement in teaching activities, leading to improved performance.

Thus, gamification is seen as promising because it offers a playful, engaging and interactive learning environment that resonates with many students with ASD. This is particularly important considering the socialization and communication difficulties that can be characteristic of ASD. Through gaming elements such as rewards, friendly competitions and challenges, gamification creates an environment where autistic students feel motivated to participate and improve their math skills.

Furthermore, by highlighting gamification as a promising approach, Pereira and Barwaldt (2022) emphasize the importance of innovation in the educational field, especially with regard to inclusive education. The authors suggest that by incorporating gamification into math teaching for students with ASD, schools can promote a more inclusive and effective environment where all students have the opportunity to learn and develop.

The study conducted by Pena et al. (2022) provides a practical perspective on the use of gamification in the context of students with Autism Spectrum Disorder (ASD). By developing the digital game "Letrinhas", the authors observed the impact of gamification on the cognition of these students. Their conclusions indicate that gamification can be an effective tool for stimulating thinking, learning and engagement in autistic children.

However, it is crucial to emphasize that the research also highlights the need for balance and supervision in the use of these tools. The warning about the potential social isolation caused by excessive use of gamified tools is extremely important. This is because, although gamification can be engaging and motivating, uncontrolled use of electronic devices can result in a withdrawal from real-world social interactions, which is a significant concern, especially for children with ASD, who often already face challenges in social interaction skills.

Authors such as Silva, Coelho and Godoy (2022) emphasize that gamification offers several benefits for people with ASD, including improved concentration, collaborative learning and engagement, contributing to the development of autonomy.

Gamification is seen as an effective means of increasing the concentration of students with ASD. The engaging and interactive nature of games can help these students focus on learning tasks in a way that can be challenging in traditional classroom environments.

The study emphasizes that gamification also promotes collaborative learning among students with ASD. This collaboration can be facilitated through group activities and games that encourage interaction between students, helping to develop social and communication skills.

Gamification is also recognised for its potential to increase student engagement. The playful and challenging nature of games makes the learning process more stimulating and interesting for students with ASD, making the teaching environment more attractive.

Also according to the authors, gamification is seen as a tool that can promote the development of autonomy in students with ASD. By actively participating in gamified activities, these students can acquire skills that allow them to take greater control over their learning and daily lives.

The approach of gamification in Primary School, from the perspective of Rodrigues and Clauss (2022), offers a promising insight into how this strategy can be a valuable resource for the development of autistic children. Gamification, which uses playful, interactive and competitive elements to engage students, can be particularly beneficial for children with autism, as many of them show greater interest and involvement in activities that encourage their active participation.

The benefits of gamification in developing social, cognitive and psychological skills are remarkable. Gamification can help improve social interaction, logical reasoning, concentration and problem-solving. In addition, the motivating nature of games can make the learning process more enjoyable and effective, encouraging students to try harder and persist with their tasks.

However, a critical point that the research by Rodrigues and Clauss (2022) highlights is the limited inclusion of resources for disabled people in the context of gamification. This is largely due to the fact that many media companies do not invest adequately in making their technologies and games accessible to all people, including those with disabilities. The lack of specific resources and adaptations can exclude children with special needs, denying them the opportunity to fully benefit from gamification strategies.

In this sense, it is crucial to emphasize that the effectiveness of gamification in the inclusion of autistic children and those with other special needs depends to a large extent on the training and preparation of teachers. Educators play a central role in the successful implementation of gamification, adapting it to students' individual needs, making adjustments when necessary and monitoring progress. Therefore, Rodrigues and Clauss' research highlights the importance of providing ongoing training to teachers so that they can maximise the benefits of gamification in the inclusive educational context.

The study by Santos, Lima and Santos (2021) emphasizes the relevance of gamification as an effective approach to teaching autistic children. The research highlights that the application of game elements in the educational context can result in notable improvements in the attention, behavior and learning of these children. Gamification, by engaging students in playful and motivating activities, can be particularly beneficial for autistic children, who often face specific challenges in the learning and socialization process. Through games and interactive activities, autistic children can engage more actively and constructively, improving not only their academic performance but also their social and behavioral skills.

For the authors, the successful implementation of gamification in teaching autistic children is not without its challenges. The study mentions two major obstacles. Firstly, a lack of proper planning can jeopardize the effectiveness of the strategy. Gamification requires a careful approach, taking into account the specific needs of autistic children and adapting the game elements appropriately.

In this sense, robust planning is key to ensuring that gamification is truly beneficial, as is ongoing training for teachers. Gamification requires educators to fully understand how to apply this strategy effectively, and this requires specific knowledge and skills. Ongoing training allows teachers to keep up to date with best practice and adapt their approaches according to the constantly evolving needs of their autistic students.

The analysis carried out by Coelho et al. (2022) on the use of gamification in inclusive special education highlights the potential of this innovative strategy to address significant challenges in inclusive teaching contexts. Gamification involves applying game elements and design mechanics to educational activities, with the aim of improving student motivation, engagement and learning. In this sense, its relevance in inclusive special education is remarkable for several reasons.

Promoting inclusion is one of the main pillars highlighted by Coelho et al. (2022). Gamification offers a way to create a learning environment in which all students, regardless of their abilities or disabilities, can actively participate. By adapting activities and challenges to meet individual needs, it contributes to building a space of equality and respect, where all students feel valued and integrated.

Gamification is also effective in improving student engagement. In special education classrooms, keeping students interested is key, and gamification does this by making educational activities more engaging and fun. Through elements such as rewards, friendly competitions and engaging narratives, students feel more motivated to actively participate in the learning process.

Another important point highlighted by Coelho et al. (2022) is the promotion of cooperation between students. Gamification often incorporates elements of collaboration and healthy competition, encouraging students to work together to achieve common goals. This not only strengthens social and teamwork skills, but also promotes positive relationships between students with and without disabilities, contributing to a more harmonious school environment.

The individualisation of learning is a key feature of gamification in inclusive special education. Educators can personalise activities according to the needs of each student, ensuring that no one is left behind. This is particularly important in inclusive teaching contexts, where the diversity of abilities and needs is significant.

In addition, gamification takes advantage of technology to make learning more accessible. Educational games can be designed to be compatible with assistive technology, allowing students with disabilities to participate fully in activities. This demonstrates gamification's ability to embrace technological innovation in favour of inclusion.

Finally, motivation and meaningful learning are crucial aspects of gamification. Students become more actively involved in tasks that they find fun, which can result in more effective and lasting learning. In addition, educational games provide opportunities to assess student progress and provide real-time feedback, helping educators to identify individual learning needs.

The study conducted by Silva et al. (2022) emphasizes the effectiveness of gamification in the context of teaching literacy and literacy. This is an extremely important point, since literacy is an essential foundation for educational development and participation in society. Gamification, which involves incorporating game elements into learning activities, offers an innovative approach to making the literacy process more engaging and meaningful.

One of the main conclusions of the study is the promotion of student engagement. Gamification is known for its ability to keep students motivated, something particularly vital in the literacy phase, where motivation is a critical factor for success. Game elements such as challenges, rewards and narratives captivate students' attention, making learning more attractive.

The research by Silva et al. (2022) also emphasizes the importance of meaningful learning. Gamification doesn't just teach basic literacy skills; it also enables students to apply these skills in a practical and relevant way in a gaming context. This strengthens understanding and retention of knowledge, making learning more lasting and applicable.

The study also highlights the combination of gamification with assistive technologies. This gives students autonomy, regardless of their specific needs. Assistive technologies can be adapted to meet individual needs, ensuring that literacy teaching is accessible to all students, including those with disabilities. This approach aligns with the quest for inclusive and equal education.

As such, gamification allows for real-time feedback and opportunities to assess student progress. This is valuable for educators in adapting teaching strategies according to students' individual needs, creating a more personalized and effective learning environment.

IV. Conclusion

This systematic review has provided an understanding of the potential of gamification in the educational context of students with Autism Spectrum Disorder (ASD). The studies analysed highlighted the effectiveness of gamification as a strategy to promote learning, engagement and the development of autistic students. By incorporating playful, interactive and competitive elements into teaching activities, gamification has proven to be a promising tool, offering an engaging and motivating learning environment.

The results obtained in this research highlight the importance of gamification as an innovative approach, especially in the context of inclusive education. By creating an environment where all students have the opportunity to actively participate, gamification promotes equality and the valuing of individualities, contributing to more effective and inclusive teaching. However, it is crucial to emphasise that the research also warned of significant challenges, such as the potential social isolation arising from the uncontrolled use of electronic devices and the lack of specific resources and adaptations for children with special needs.

Furthermore, the successful implementation of gamification depends on the ongoing training of teachers, who play a central role in adapting the strategy to the individual needs of the students. The analysis of the studies showed that gamification can offer notable benefits, including improved concentration, collaborative learning, engagement and the development of autonomy.

Gamification can also be particularly effective in teaching essential skills, such as literacy, and in promoting meaningful learning. Gamification, when combined with assistive technologies, can guarantee accessibility for all students, regardless of their specific needs.

Therefore, the implementation of gamification, combined with the training of educators and the responsible use of technology, has transformative potential in the field of inclusive education. By adopting this innovative approach, educational institutions can create an environment where equality, engagement and effective learning are within the reach of all students, including those with ASD and special needs.

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