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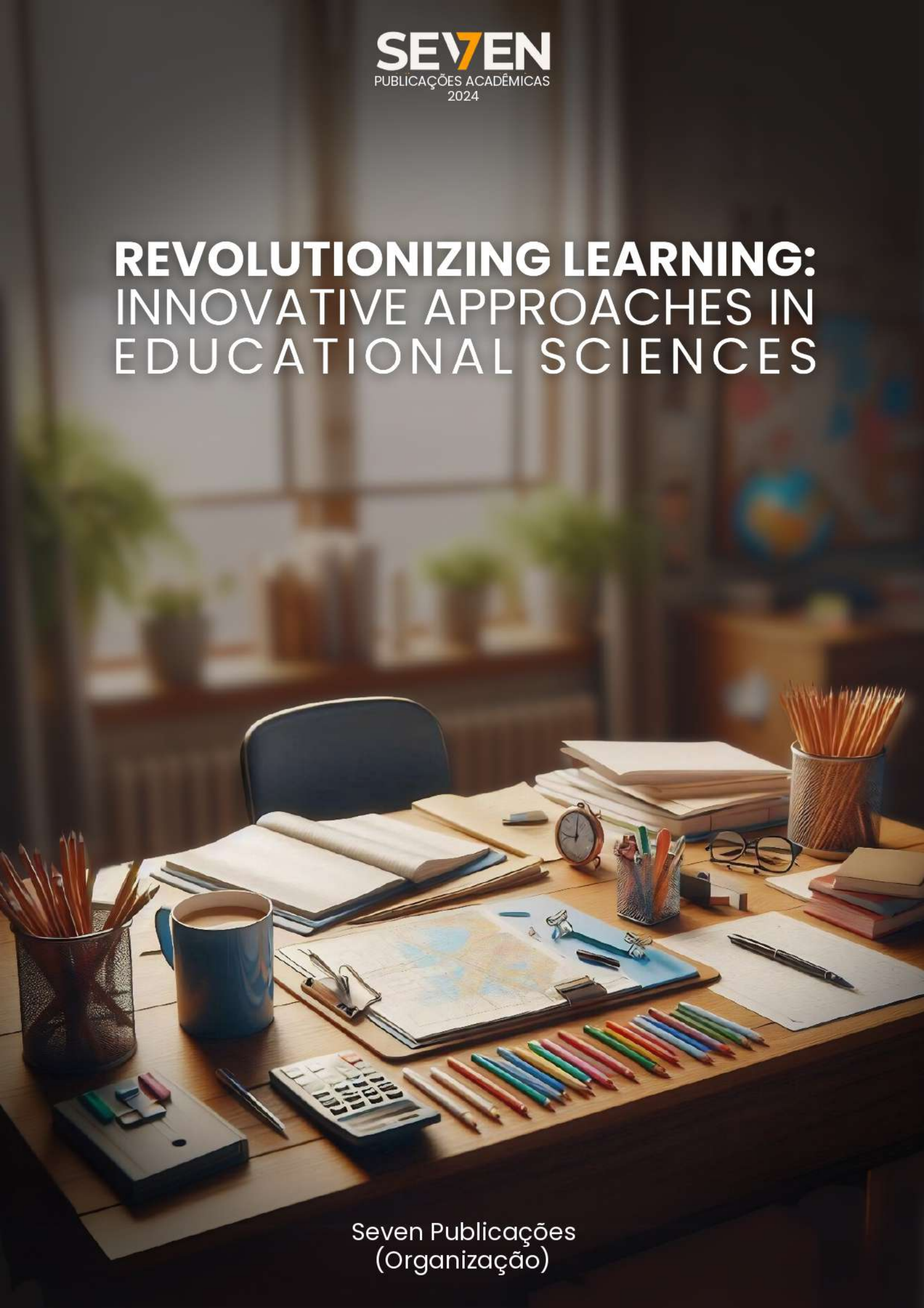
REVOLUTIONIZING LEARNING: INNOVATIVE APPROACHES IN EDUCATIONAL SCIENCES



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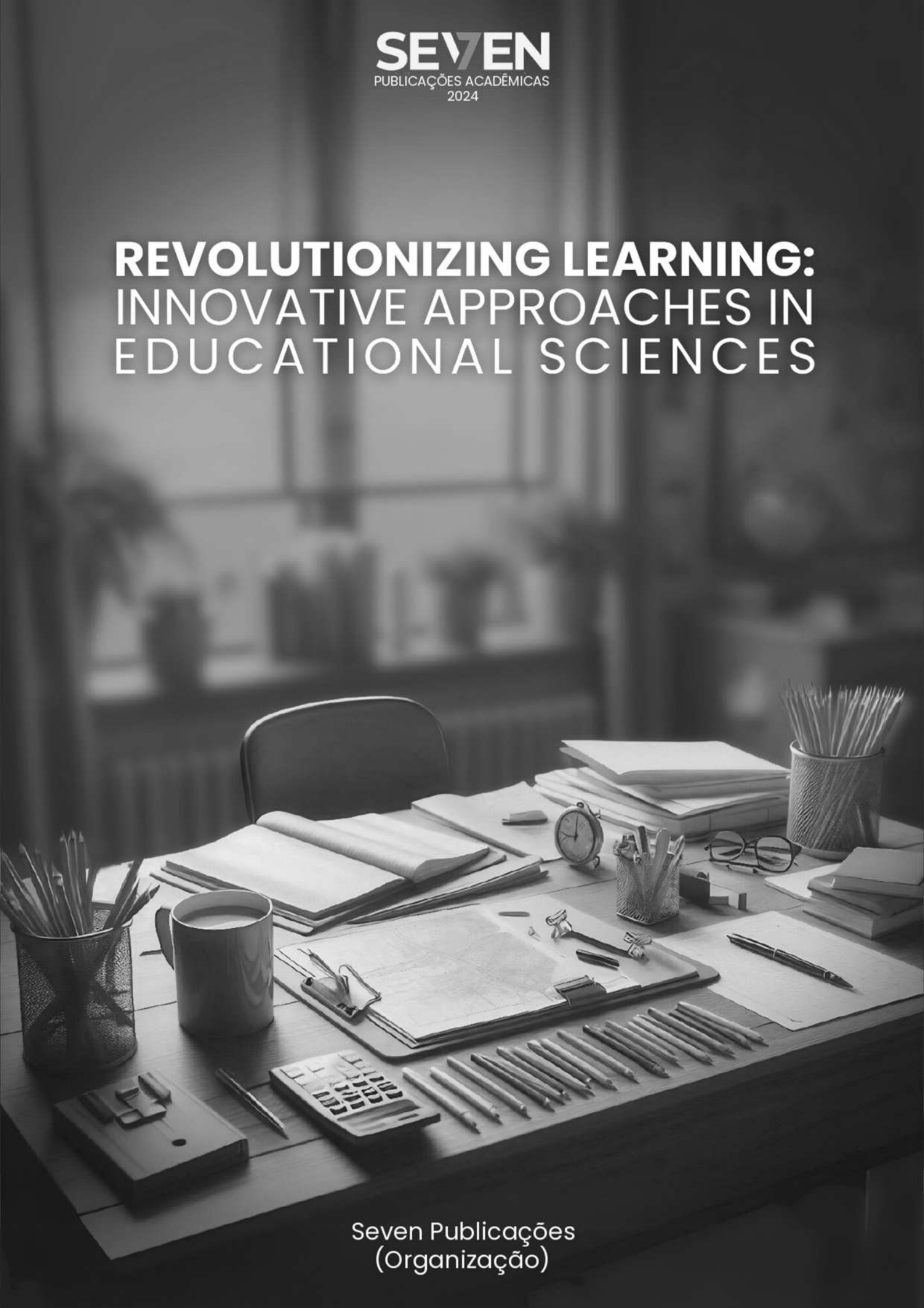

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International Cataloguing in Publication Data (CIP) (Brazilian Book Chamber, SP, Brazil)

S498r
Seven Editora.
Revolutionizing Learning [electronic resource] : Innovative Approaches in Educational Sciences / Seven Editora. – São José dos Pinhais, PR: Seven Editora, 2024.
Electronic data (1 PDF).

Includes bibliography.
ISBN 978-65-6109-092-6

1. Education. 2. Revolution. 3. Learning. I. Title.

CDU 37

Indexes for systematic catalogue:

1. CDU: Education 37

Cataloguing at source: Bruna Heller (CRB10/2348)

Seven Publications Ltda
CNPJ: 43.789.355/0001-14
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SUMMARY

ANALYSIS OF THE LACK OF IMPLEMENTATION OF THE COST SYSTEM IN A PUBLIC HIGHER EDUCATION INSTITUTION

https://doi.org/10.56238/sevened2024.033-001

Luiz Antonio de Oliveira Dantas[1], Denis Forte[2] and Nadia Wagih El Qadri[3]

ABSTRACT

This article aims to analyze the impacts of the non-implementation of an efficient cost system in a Brazilian public higher education institution (HEI) and to propose recovery strategies based on the Spanish Costing Model (ECM).

Methodology: The research follows a qualitative approach, using descriptive and exploratory methods. Data collection included document analysis, semi-structured interviews with managers and employees, and participant observation of the administrative and financial processes of the HEI.

Gap: Despite the detailed recommendations and benefits projected by the study "Cost-per-student analysis as a tool for managerial decision in a public higher education institution" by Luiz Antonio de Oliveira Dantas (2022), the Brazilian public HEI analyzed, which did not authorize the disclosure of its name, did not adopt these practices, resulting in ineffective management and deterioration of the quality of services.

Results and Contributions: The analysis revealed that the absence of an efficient cost system led to financial uncontrollability, operational inefficiency, a drop in the quality of services, and a lack of transparency. The late implementation of the MCE proved effective in reversing these problems, improving resource allocation, operational efficiency, and quality of services. This study contributes to the academic literature by demonstrating the importance of standardized cost systems for the sustainability of public HEIs.

Relevance: This study reinforces the critical importance of cost-efficient systems for financial management and service quality in public HEIs, offering valuable insights for managers and policymakers.

Impact: The experience of the HEI studied serves as a guide for other institutions facing similar challenges, highlighting the need for continuous capacity building and adoption of efficient cost management practices to ensure financial sustainability and transparency.

Keywords: Cost management. Public higher education institution. Financial sustainability.

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INTRODUCTION

CONTEXTUALIZATION AND RESEARCH PROBLEM

Cost management in public higher education institutions (HEIs) plays a crucial role in the efficiency and transparency of the administration of these resources. In a scenario where financial optimization is increasingly demanded by society and regulatory bodies, the adoption of robust and accurate cost systems is imperative to ensure the sustainability of institutions and the quality of the services provided. The study "Cost-per-student analysis as a tool for managerial decision in a public higher education institution" by Luiz Antonio de Oliveira Dantas (2022) suggests the implementation of a Spanish costing model (MCE) as a solution to improve the financial management of Brazilian public HEIs.

Despite the detailed recommendations and projected benefits, the institution did not adopt these practices, resulting in severe consequences. This article examines the case of a public HEI that, by neglecting the study guidelines, faced a significant deterioration of its financial and administrative situation in 2024. From this analysis, a new problem-question is proposed: "How did the lack of implementation of an efficient cost system affect the financial sustainability and quality of the services offered by a Brazilian public higher education institution?"

The lack of an adequate cost system prevents accurate and detailed financial information from being obtained, which is essential for making informed managerial decisions. This study seeks to explore the impacts of this neglect, providing a basis for discussing recovery strategies and late implementation of the recommended cost system. The analysis aims not only to understand past mistakes, but also to provide a clear path forward for other institutions that have yet to adopt efficient cost management practices.

By highlighting the challenges faced by the HEI in question and the potential benefits of a well-implemented costing system, this article contributes to the academic and practical literature in the field of accounting and public finance. In addition, it offers valuable insights for managers of public HEIs, emphasizing the importance of following proven guidelines for sustainability and administrative efficiency.

The current context of Brazilian public HEIs is marked by financial challenges, pressure for transparency, and the need for efficiency in the use of public resources. Implementing cost-efficient systems, such as MCE, is essential to provide accurate information that supports managerial decision-making. However, many institutions have not yet adopted these practices, which leads to ineffective management and deterioration in the quality of the services offered.

THEORETICAL FRAMEWORK

COST MANAGEMENT IN THE PUBLIC SECTOR

Cost management in the public sector is a critical area that aims to ensure efficiency and transparency in the use of public resources. According to NBC T 16.2 – Assets and Accounting Systems, public accounting must provide information on the identification, measurement, evaluation, registration, control and disclosure of acts and facts of the management of public assets, guiding decision-making and accountability (CFC, 2009).

Complementary Law No. 101 of 2000, known as the Fiscal Responsibility Law (LRF), determines that the public administration maintains a cost system to allow the evaluation and monitoring of budgetary, financial and asset management (BRASIL, 2000). However, the lack of standardization and the low culture of using cost systems in the public sector have been significant obstacles to the effective implementation of these guidelines (Alonso, 1999; Mauss & Souza, 2008).

COST SYSTEMS: THE SPANISH COSTING MODEL (MCE)

The Spanish Costing Model (ECM), developed by the Oficina de Cooperación Universitaria (OCU) in partnership with the University of Malaga (UMA), stands out as an effective solution for cost management in higher education institutions (Díaz et al., 2013). MCE is designed to overcome the limitations of previous systems, offering a solid platform that is technologically robust and capable of integrating between all universities that adopt the system.

This model is based on Activity-Based Costing (ABC), which allocates overhead costs more accurately by associating them with the specific activities that generate them. This allows for a more detailed and accurate analysis of costs, facilitating informed managerial decision-making (Banha, 2013).

IMPORTANCE OF STANDARDIZATION AND TRANSPARENCY

The standardization of cost measurement methods in HEIs is essential for the transparency and comparability of financial information. According to Reinert and Reinert (2005), the absence of a standardized system makes it difficult to compare institutions and identify best management practices.

The OECD (2017) highlights the importance of efficient investments in higher education, revealing that the cost per student in Brazil is comparable to some European countries, but the quality of education is still lagging behind. The adoption of a cost-per-

student measurement model can improve public management and the quality of educational services.

CHALLENGES AND BENEFITS OF IMPLEMENTING THE COST SYSTEM

Implementing a cost-efficient system faces significant challenges, including organizational resistance, the need for cultural changes, and the technical complexity of developing new systems (Díaz et al., 2013). However, the potential benefits are substantial, including improved financial management, increased transparency and accountability, and a solid foundation for strategic decision-making (Martins & Peixinho, 2017).

Souza (2008) argues that adequate cost management can provide important subsidies for public managers, helping in the planning, control and evaluation of costs. Faria (2010) complements by highlighting the need for awareness and training of employees for efficient cost management in the public sector.

CASE STUDIES AND RECENT STUDIES

Recent studies have shown the effectiveness of well-implemented cost models in European universities. Lopes, Suaza and Acevedo (2014) demonstrated that the adoption of the ECM in Spanish universities resulted in significant improvements in cost management and operational efficiency.

In Brazil, Ramos' (2013) research on cost management in a federal educational institution highlighted the importance of accounting reports as tools for managerial decision-making. However, the lack of a standardized cost system model is still a challenge to be overcome.

The theoretical framework highlights the urgent need to implement standardized and efficient cost systems in Brazilian public HEIs. The adoption of models such as the MCE can provide the necessary basis for sound, transparent, and efficient financial management, contributing to the sustainability and improvement of the quality of educational services. The Spanish experience serves as a valuable example, highlighting the benefits and challenges of this implementation. For Brazilian HEIs, the awareness and training of managers and employees are essential steps for the successful adoption of these practices.

SUMMARY OF THE STUDY/CASE INCOME AND EXPENDITURE SCENARIO

In the study "Cost-per-student analysis as a tool for managerial decision in a public higher education institution" by Luiz Antonio de Oliveira Dantas, one of the scenarios analyzed was the financial situation of the institution without transfers from the municipality

and without financial income. This scenario revealed a serious deficiency in the institution's financial sustainability, highlighting a critical management problem.

Problem

The survey identified that, without the financial transfers of the municipality and the income from financial investments, the institution's revenue was significantly below what was necessary to cover its expenses. Specifically, the revenue was 14% less than the expenses necessary for the proper functioning of the institution.

Search Result Found

The result of this analysis showed the financial vulnerability of the public higher education institution (HEI) in scenarios of revenue restriction. This deficit financial condition imposes serious challenges for the maintenance of operations, quality of services and the long-term sustainability of the institution.

Implications

1. **Insufficient Resources:** Lack of sufficient resources implies the inability to cover basic operating costs, which can lead to reduced services, cuts in academic and administrative programs, and compromised quality of education.
2. **Dependence on External Sources:** The analysis highlighted the institution's high dependence on external sources of financing, such as transfers from the municipality and financial income. This dependence makes the institution vulnerable to economic and political changes that could affect these sources of revenue.
3. **Need for Financial Restructuring:** The situation reveals the urgent need to restructure the institution's financial management, seeking alternatives to increase revenue and/or reduce expenses to achieve a sustainable financial balance. **Suggestions**

To address this critical situation, the Study suggests several strategic measures:

1. **Diversification of Revenue Sources:** The institution should explore new sources of revenue, such as partnerships with the private sector, development of paid extension projects, and fundraising through funds and donations.
2. **Expense Optimization:** Implement cost control measures and optimize operating expenses, identifying areas of waste and seeking efficiency in administrative and academic processes.

3. **Long-Term Financial Planning:** Develop long-term financial planning that considers revenue constraint scenarios and includes strategies to mitigate the risks associated with reliance on external sources.

Strengthening Financial Management: Train managers and employees in the use of advanced financial management tools, such as the Spanish Costing Model (MCE), to improve transparency, decision-making, and financial sustainability.

Conclusion

The analysis presented in the Study reveals an alarming situation in which, without the transfers from the municipality and without the financial income, the institution's revenue is 14% lower than the necessary expenses. This scenario emphasizes the urgency of adopting strategic measures to diversify revenue sources, optimize expenses, and strengthen financial management, ensuring the sustainability and quality of the services offered by the public higher education institution.

METHODOLOGY

RESEARCH APPROACH

This study uses a qualitative approach with descriptive and exploratory methods to analyze the impacts of the non-implementation of an efficient cost system in a Brazilian public higher education institution (HEI). The research is based on a case study of a HEI that neglected the guidelines proposed in the Study "Cost-student analysis as a tool for managerial decision in a public higher education institution" by Luiz Antonio de Oliveira Dantas (2022).

Research Strategy

The research follows the action research strategy, which is characterized by the combination of action and reflection in a continuous process of investigation. This method was chosen due to its ability to provide an in-depth understanding of the phenomena studied, while allowing for direct intervention in the context of research to improve existing practices.

Data Collection

Data collection was carried out in three main stages:

1. **Document Analysis**: Financial and administrative documents of the HEI were analyzed, including expense reports, financial statements, meeting minutes and

strategic documents. The document analysis was essential to understand the institution's financial situation and identify gaps in cost management.

2. **Semi-structured interviews**: Semi-structured interviews were conducted with managers, administrators and employees of the HEI. The interviews sought to explore perceptions and experiences related to cost management, identify the main challenges faced and collect suggestions for process improvement. The interviews were recorded and transcribed for further analysis.

Participant Observation: Participant observation was used to obtain a direct view of the institution's administrative and financial processes. The researcher participated in meetings and followed daily activities, recording detailed observations in a field diary. This technique allowed the collection of rich and contextual data on cost management practices.

DATA ANALYSIS

The collected data were analyzed using the content analysis technique, which allows the identification of relevant patterns, themes and categories from qualitative data. The analysis was conducted in several stages:

1. **Coding**: Data from interviews and observations were coded to identify emerging themes. Initial categories were defined based on the existing literature and adjusted as new data were analyzed.
2. **Thematic Analysis**: The themes and categories identified were analyzed in depth to understand the relationships between them and how they influence cost management in HEI.
3. **Triangulation**: Data from different sources (documents, interviews, and observations) were triangulated to ensure the validity and reliability of the results. Triangulation allowed the verification of consistencies and discrepancies between the data.

Development of the Interventionist Proposal

Based on the data analysis, an interventionist proposal was developed for the implementation of an efficient cost system in the HEI. The proposal was based on the best practices identified in the literature and adapted to the specific context of the institution. The implementation of the proposal has been iteratively monitored and adjusted to ensure its effectiveness and sustainability.

Proposal Validation

The validation of the proposal was carried out through continuous feedback from managers and employees of the HEI. Workshops and training sessions were conducted to train those involved in the new cost management methodology. The effectiveness of the proposal was evaluated through indicators of financial performance and quality of the services offered by the institution.

Study Limitations

This study has some limitations. First, being a single case study, the results may not be generalizable to all Brazilian public HEIs. In addition, resistance to change and the availability of accurate data posed challenges during the survey. Future research could explore the implementation of the cost system across multiple institutions to validate the findings of this study.

The methodology adopted in this study allowed a comprehensive and detailed analysis of the impacts of the non-implementation of an efficient cost system in a Brazilian public HEI. The qualitative approach and action research strategy provided a deep understanding of the challenges faced and possible solutions, contributing to the improvement of cost management practices in public HEIs.

DISCUSSION OF THE RESULTS

IMPACTS OF NON-IMPLEMENTATION OF THE COST SYSTEM

The analysis of the data revealed that the lack of implementation of an efficient cost system had significant consequences on the financial sustainability and quality of the services offered by the HEI studied. Among the main impacts identified are:

1. **Financial Lack of Control**: The absence of a robust cost management system has resulted in poor financial decisions, such as improper allocation of resources and lack of expense monitoring. This has led to recurring budget deficits and the inability to plan properly for the future. This lack of financial control has also made it difficult to respond quickly to financial crises and implement effective corrective measures.
2. **Operational Inefficiency**: The institution was unable to accurately identify the costs associated with its various activities, which prevented the optimization of internal processes. As a result, there has been a significant waste of resources and low operational efficiency. The lack of accurate cost data made it impossible to identify areas where improvements could be made to reduce costs and

increase efficiency.

3. **Drop in the Quality of Services**: Poor financial management directly impacted the quality of services offered by the HEI. The lack of adequate resources for infrastructure maintenance, acquisition of teaching materials, and investments in academic programs has resulted in a deteriorating educational environment and student and staff dissatisfaction. The drop in the quality of services has damaged the institution's reputation, making it difficult to attract new students and qualified teachers.
4. **Transparency and Accountability**: Without an efficient cost-effective system, the institution faced difficulties in ensuring transparency and accountability. The lack of detailed information on expenses and resource allocation has generated distrust among stakeholders, including students, teachers, funders, and regulatory bodies. This has also made it difficult to obtain new financing and cooperate with external partners.

COMPARATIVE ANALYSIS WITH THE LITERATURE

The results of this study corroborate findings from previous research that highlight the importance of well-implemented costing systems in the public sector. For example, Banha (2013) and Díaz et al. (2013) emphasize that the adoption of costing models, such as ABC and MCE, allows for better allocation of resources and more effective financial management. Ramos' (2013) research also points out that the lack of detailed accounting reports can lead to inadequate financial management, making it difficult to make informed managerial decisions.

The existing literature also suggests that the standardization of cost measurement methods, as proposed by Reinert and Reinert (2005), is crucial to ensure comparability between institutions and improve operational efficiency. The Spanish experience with the ECM, as described by Díaz et al. (2013), demonstrates that the implementation of a standardized cost system can overcome organizational and technical challenges, resulting in significant benefits for institutions.

IMPLEMENTATION OF THE INTERVENTIONIST PROPOSAL

The interventionist proposal developed based on the collected data included the adoption of the ECM adapted to the specific needs of the HEI studied. The implementation steps involved:

1. Training and Training: Workshops and training sessions were held to train

managers and employees in the new cost management methodology. This included familiarization with the software used, as well as the principles of activity-based costing.

2. Development of Management Indicators: Financial performance and service quality indicators were defined, allowing continuous monitoring of the effectiveness of the implemented cost system. These indicators helped to identify areas that needed adjustment and to measure the impact of the changes implemented.
3. Iterative Monitoring and Adjustments: The implementation of the system has been monitored continuously, with adjustments being made iteratively to address issues and improve the effectiveness of the system. Feedback from users of the system was essential to identify weaknesses and opportunities for improvement.

OBSERVED BENEFITS

The implementation of the proposed cost system has begun to show positive results in several areas:

1. Improvement in Financial Management: There has been a significant improvement in financial control, with a better allocation of resources and a reduction in budget deficits. The institution was able to plan more efficiently, anticipating future needs and adjusting its budgets accordingly.
2. Operational Efficiency: The institution was able to identify areas of inefficiency and implement improvements in internal processes, resulting in a more rational use of available resources. This has led to a significant reduction in waste and an increase in productivity.
3. Quality of Services: With better management of resources, the quality of services offered has improved, reflected in greater satisfaction among students and staff. There was an increase in the offer of academic programs and an improvement in infrastructure conditions.
4. Transparency and Accountability: The implementation of the cost system has improved the institution's transparency and accountability, strengthening stakeholder trust and making it easier to obtain new financing. The institution began to present detailed and transparent financial reports, which were well received by regulatory bodies and financiers.

CHALLENGES AND LIMITATIONS

Despite the benefits observed, the implementation of the cost system faced significant challenges. Resistance to change was one of the main obstacles, with some managers and employees showing reluctance to adopt new practices. In addition, the technical complexity of the system required a period of adaptation and learning, during which some operational problems arose.

The discussion of the results of this study highlights the critical importance of an efficient cost system for financial sustainability and the quality of services in public higher education institutions. The experience of the HEI studied highlights the risks associated with neglecting these practices and the substantial benefits that can be gained from implementing a robust system, such as MCE. The lessons learned and the strategies developed can serve as a guide for other institutions facing similar challenges, contributing to the overall improvement of cost management in the public education sector.

FINAL CONSIDERATIONS

Efficient cost management is essential for financial sustainability and the quality of services in public higher education institutions (HEIs). This study analyzed the impact of the non-implementation of a robust cost system in a Brazilian public HEI, highlighting the negative consequences of this negligence and proposing a solution based on the Spanish Costing Model (ECM).

The results showed that the absence of an efficient cost system resulted in financial lack of control, operational inefficiency, a drop in the quality of services and a lack of transparency. These problems have significantly compromised the institution's ability to fulfill its educational mission and maintain the trust of stakeholders.

In a scenario analyzed, without the transfers from the municipality and without the financial income, the institution's revenue was 14% lower than the necessary expenses. This deficit reveals a critical dependence on external sources of financing and highlights the institution's financial vulnerability.

The late implementation of the proposed cost system, based on the ECM, proved effective in reversing many of the problems identified. The adoption of best financial management practices, combined with adequate capacity building and training, has resulted in substantial improvements in resource allocation, operational efficiency, and quality of services offered.

Despite the detailed recommendations and benefits projected by the study conducted in 2018, the institution did not accept the suggestions presented, no matter how

much dedicated efforts and training was carried out, the project has not yet been taken seriously. In 2024, the institution faces a critical situation, with serious financial and operational difficulties. The lack of action resulted in a significant deterioration of its financial sustainability and the quality of services offered.

SUGGESTIONS FOR FUTURE ACTIONS

To face the current critical situation and avoid future financial collapses, it is essential that the institution adopts urgent and effective measures:

1. **Implementation of the Spanish Costing Model (MCE):** The adoption of MCE will allow for a detailed view of costs and more robust and transparent financial management.
2. **Diversification of Revenue Sources:** Exploring new sources of revenue, such as partnerships with the private sector, paid outreach projects, and fundraising through funds and grants, is crucial to reduce reliance on transfers from the municipality and financial income.
3. **Expense Optimization:** Implement stringent cost control and operational expense optimization measures, identifying areas of waste and seeking efficiency in administrative and academic processes.
4. **Long-Term Financial Planning:** Develop long-term financial planning that includes revenue constraint scenarios and strategies to mitigate the risks associated with reliance on external sources.
5. **Capacity Building and Training:** Invest in the continuous training of managers and employees in advanced financial management practices to ensure the effective implementation and maintenance of new strategies.

The adoption of an efficient costing system is critical for the effective management of public higher education institutions. This study showed that neglecting these practices can lead to severe consequences, while implementing a robust model, such as MCE, can provide substantial benefits. The negative experience of the analyzed institution serves as a warning and a learning opportunity for other institutions. It is imperative that immediate steps are taken to adopt best financial management practices, thereby ensuring long-term sustainability and educational excellence.

Continuous improvement in cost management should be a priority for public HEIs, contributing to financial sustainability, transparency, and educational excellence. The implementation of standardized cost systems and the continuous training of managers and employees are essential steps to achieve these goals.

This study reinforces the importance of adopting standardized and efficient cost systems in public HEIs. The experience of the HEI studied demonstrates that the implementation of a cost system is not only a regulatory requirement, but a practical necessity to ensure the sustainability and efficiency of operations.

Resistance to change and technical complexity are significant challenges that need to be managed proactively. Continuous training of managers and employees is crucial for successful implementation and for maintaining an effective costing system.

Future research could explore the implementation of cost systems across multiple institutions to validate the findings of this study and identify additional variables that influence implementation success. Comparative studies between different costing models could provide valuable insights into the best practices for financial management in public HEIs.

In addition, the investigation of specific strategies to overcome resistance to change and promote the adoption of new financial management practices could contribute significantly to the existing literature.

The adoption of an efficient costing system is critical for the effective management of public higher education institutions. This study showed that neglecting these practices can lead to severe consequences, while implementing a robust model, such as MCE, can provide substantial benefits. The lessons learned from the experience of the HEI studied can serve as a valuable guide for other institutions seeking to improve their financial management and the quality of the services offered.

Continuous improvement in cost management should be a priority for public HEIs, contributing to financial sustainability, transparency, and educational excellence. The implementation of standardized cost systems and the continuous training of managers and employees are essential steps to achieve these goals.

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DIGITAL INNOVATIONS AND SOCIAL-EMOTIONAL EDUCATION: BUILDING RESILIENCE IN EDUCATIONAL SETTINGS

https://doi.org/10.56238/sevened2024.033-002

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ABSTRACT

This study explores the impact of digital innovations on the promotion of social-emotional education, with a focus on developing resilience in school environments. The growing insertion of technologies in the educational context offers new opportunities to address socio-emotional skills, especially in an increasingly dynamic and digitized world. The use of tools such as emotional self-regulation apps, interactive games, and personalized platforms has shown potential to improve fundamental skills, such as empathy, self-regulation, and coping with adversity, strengthening students' integral learning. The survey also highlighted that, in addition to the benefits, the use of technologies in the classroom presents significant challenges, such as the lack of technological infrastructure in many institutions and the need for continuous training of educators for the effective application of these tools. Another aspect addressed is the essential role of the teacher as a mediator, ensuring that technology is used in a balanced way and with pedagogical intentionality. Teacher mediation is essential for digital innovations to complement the teaching-learning process, without replacing human interactions, which are equally essential for socio-emotional development. In addition, the study reveals the importance of public policies that ensure technological resources and adequate training for education professionals. It is concluded that, although digital technologies have great potential to contribute to the socio-emotional development of students, their effectiveness depends on a structured implementation, which contemplates both technological and pedagogical aspects. This study reinforces the relevance of a conscious and planned use of technology, promoting an educational environment that favors the construction of resilience and other socio-emotional skills that are fundamental for student success.

Keywords: Socio-emotional Education. Digital Innovations. Resilience. Teacher Mediation.

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INTRODUCTION

The incorporation of digital technologies in schools has profoundly transformed the dynamics of teaching and learning, providing new ways of transmitting knowledge and interaction between students, teachers and content. In addition to facilitating access to information, these technological innovations offer resources that make the educational experience more dynamic and personalized. However, the increasing use of these tools also brings to light the need for reflection on the emotional health of students, who are often exposed to a large amount of stimuli and information.

In this context, social-emotional education stands out as a crucial strategy to complement academic learning and strengthen essential skills, such as self-control, empathy, and resilience. These skills are essential for students to manage their emotions, establish healthy relationships, and make conscious decisions. The presence of these skills in the school environment contributes to the creation of a more welcoming space, where students feel prepared to face challenges and develop the resilience necessary to overcome adversity.

The interaction between technological innovations and socio-emotional development has great potential to enrich the educational environment. Digital tools, such as self-reflection apps and interactive learning platforms, can be utilized to promote emotional self-understanding and strengthen students' mental health. When integrated with pedagogical practices that encourage socio-emotional development, these technologies become powerful allies in creating a more balanced and inclusive learning environment.

By adopting an approach that combines technological resources and socio-emotional skills, schools have the opportunity to train students who are better prepared to deal with the challenges of a constantly changing world. Building resilience, in particular, is essential for young people to be able to face difficult situations with self-confidence and determination. In this way, the school environment becomes a space not only for academic development, but also for strengthening students' emotional well-being and ability to overcome.

Given this scenario, the present study aims to analyze how digital innovations can be integrated into teaching to promote social-emotional education and build student resilience in educational environments.

THEORETICAL FRAMEWORK

The development of socio-emotional skills in the school context has been widely discussed in the contemporary literature, especially with regard to building resilience and

the use of digital technologies to support this process. Socio-emotional skills are understood as a set of skills that allow individuals to manage their emotions, establish healthy relationships, and face challenges assertively. This set of skills is essential for students to be able to deal with the pressures and challenges of the school environment and life in society, favoring learning and integral development (Silva et al., 2021).

In the context of education, the integration of digital technologies has been seen as an ally in the development of these skills. Tools such as emotional self-regulation apps and interactive learning platforms have shown potential to strengthen socio-emotional skills, promoting self-knowledge and empathy among students. Recent studies indicate that technology, when used strategically, contributes to creating a more engaging and inclusive environment, where students feel more motivated and supported in their learning journeys (GOMES; ALMEIDA, 2020).

Resilience is one of the most discussed skills in the field of social-emotional education, as it empowers students to face adversity with confidence and optimism. According to Andrade and Oliveira (2022), the construction of resilience in the school environment can be enhanced through pedagogical practices that integrate the use of digital technologies. These practices allow students to develop skills such as problem-solving and decision-making, which strengthens their ability to adapt in the face of difficulties.

Social-emotional education, combined with technology, also facilitates the creation of collaborative environments, in which students learn to work as a team and share experiences. From this perspective, interactive digital platforms enable group activities that encourage cooperation and empathy, fundamental aspects for socio-emotional development. According to Silva and Santos (2021), collaboration in digital environments not only favors learning, but also promotes the strengthening of bonds between students, contributing to a healthier school climate.

In addition, technology allows for the personalization of teaching, adapting activities according to the individual needs of each student. This personalization is particularly beneficial for social-emotional development, as it respects the pace and unique characteristics of each student. Studies indicate that adaptive and personalized learning environments are more effective in promoting students' self-confidence and autonomy, elements that are essential for building resilience (FERREIRA; COSTA, 2019).

Another relevant aspect is the use of digital technologies to monitor students' progress in socio-emotional development. Monitoring tools, such as continuous feedback apps, allow teachers and administrators to closely monitor the emotional development of

students, quickly identifying difficulties and necessary interventions. Martins and Pereira (2020) state that this practice enables more precise pedagogical interventions, with actions aimed at the emotional support of students in critical moments.

The importance of developing a growth mindset in students is also underscored by recent literature. According to Mendes and Rocha (2021), the growth mindset is a characteristic that can be strengthened with the use of technologies that encourage continuous learning and facing challenges. These digital tools help students see mistakes as learning opportunities, increasing their resilience and willingness to overcome difficulties.

Although technology has numerous benefits, it is important that its use in social-emotional education is balanced and integrated with reflective pedagogical practices. According to Cardoso and Lima (2019), the excessive use of digital tools can lead to social distancing and technological dependence. Therefore, the role of the educator is fundamental to mediate the use of technology, encouraging students' reflection and self-knowledge, and ensuring that digital interactions are healthy and constructive.

The implementation of social-emotional education programs with the support of digital technologies requires adequate preparation of educators, who need to be trained to use these tools effectively. Capacity building and training on the pedagogical use of technology help teachers integrate social-emotional education into their teaching practices in a meaningful way. Recent studies highlight that the continuous training of teachers is crucial for technology to be used in a way that promotes emotional well-being and student engagement (VIEIRA; SOUZA, 2022).

Thus, the use of digital technologies in the socio-emotional development of students represents an innovation in the educational field, but requires a balanced and planned approach. For technology to truly contribute to the strengthening of socio-emotional skills, it is essential that schools promote a collaborative and reflective learning environment, where students can develop their resilience and face the challenges of the future safely and autonomously.

RESULTS AND DISCUSSIONS

The present research focused on investigating the impact of digital innovations on the socio-emotional development of students, with an emphasis on building resilience in educational environments. The data analysis, consisting of questionnaires applied to educators and observations of pedagogical practices, revealed that the use of digital technologies can, in fact, play a transformative role in the process of socio-emotional literacy. The participating educators highlighted that technological tools contribute to the

development of skills such as self-regulation, empathy, and resilience, corroborating the reviewed literature (Silva et al., 2021; GOMES; ALMEIDA, 2020).

The results indicate that pedagogical practices that integrate digital technologies promote a more dynamic and inclusive environment, allowing students to interact collaboratively and adaptively. The use of emotional self-regulation apps and educational games proved to be effective in promoting students' autonomy and self-knowledge, which strengthens their coping and adaptation skills. These findings are in line with the studies by Andrade and Oliveira (2022), which highlight the potential of digital technologies to strengthen resilience in school contexts.

Another relevant point identified was the ability of technologies to facilitate the personalization of teaching, adjusting activities and resources to the pace of each student. This feature allows students to advance according to their individual needs and abilities, which contributes to increased confidence and motivation. Thus, the digital environment not only makes learning more attractive, but also more effective for socio-emotional development, as discussed by Ferreira and Costa (2019).

The analysis also revealed challenges in the implementation of these technologies, especially in schools with limited infrastructure and lack of continuing teacher training. Some educators reported difficulties in adapting digital tools to socio-emotional content and in establishing a balance between the use of technology and face-to-face interaction. These challenges reinforce the importance of a solid education for educators, enabling them to use technology in a strategic and balanced way, as suggested by Cardoso and Lima (2019) and (VIEIRA; SOUZA, 2022).

Additionally, the data show that the excessive use of technologies can, in some cases, contribute to digital dependence and social isolation of students. Thus, it is crucial that the use of technologies in social-emotional education is well mediated, prioritizing a conscious and intentional use. Teacher mediation becomes, therefore, essential to guide students in the development of socio-emotional skills with the support of technology, without these tools replacing the human interaction necessary for effective and inclusive learning.

Table 1 presents a summary of the main variables investigated, results found and implications for pedagogical practice.

Table 1: Main Results and Implications of the Research on Digital Innovations and Social-Emotional Education

Investigated Variable	Description of Results	Implications for Pedagogical Practice
Resilience Development	The use of self-regulation apps and educational games reinforces students' ability to cope with adversity.	Implementation of digital activities that encourage coping with challenges and emotional self-regulation.
Collaboration and Empathy	Digital collaborative tools encourage cooperation between students, promoting empathy and building healthy relationships.	Development of group activities that promote collaborative work and respect for differences.
Personalization of Teaching	Technologies allow you to adjust the pace and activities according to the individual needs of the students, increasing their confidence and motivation.	Use of adaptive software to personalize learning and promote student autonomy.
Infrastructure Challenges	Limitations in technological infrastructure make it difficult to integrate digital technologies, especially in schools with lower purchasing power.	Need for investment in technological infrastructure to ensure equal access.
Training of Educators	Teachers' difficulty in adapting digital tools to socio-emotional content without specific training.	Investment in continuous training for educators to use technologies in an effective and balanced way.
Risk of Digital Addiction	Excessive use of digital technologies can lead to dependence and social isolation of students.	Importance of teacher mediation to encourage the balanced use of technologies, integrating face-to-face and reflective activities.
Teacher Interaction and Mediation	Fundamental role of teachers in mediating the use of technologies to ensure that they complement, and not replace, human interactions in learning.	Encouragement of teacher training as mediators of the use of technology, promoting reflection and the intentional use of digital tools.
Autonomy and Self-Knowledge	Technologies help students develop autonomy and self-regulation, facilitating self-knowledge and responsibility for their own learning.	Creation of activities that encourage self-knowledge and autonomy, with the support of technologies that provide real-time feedback.
Balance between Digital and Face-to-Face	Difficulty in maintaining the balance between digital and face-to-face activities for complete socio-emotional development.	Planning of mixed activities that combine the use of digital technologies with face-to-face interactions, aiming at the integral development of students.
Impact on Motivation and Engagement	Technologies increase student engagement by making activities more interactive and attractive.	Use of interactive platforms to motivate students, keeping the focus on building socio-emotional skills.

Source: Authorship.

In summary, the results indicate that digital technologies have great potential to promote socio-emotional development, especially in building resilience, when well integrated with pedagogical practices. However, it is necessary to overcome challenges such as the lack of infrastructure and the need for teacher training for the use of these technologies to be truly effective. The research reinforces the importance of the role of teachers as mediators, ensuring that the use of technology is balanced and that it favors the integral development of students.

FINAL CONSIDERATIONS

The present study aimed to investigate the impact of digital innovations on the socio-emotional development of students, with an emphasis on building resilience in educational environments. From a theoretical and empirical analysis, we sought to understand how digital technologies can promote socio-emotional literacy, offering support to the development of fundamental skills such as self-regulation, empathy and coping with adversity. The introduction of technological tools in the school environment has been consolidating itself as an important strategy to enrich the educational process, meeting the needs of students in an increasingly digital world.

The results obtained revealed that technology, when used strategically, can enhance social-emotional learning by offering resources that facilitate the personalization of teaching and student engagement. Tools such as emotional self-regulation apps and interactive games have been shown to be effective in promoting autonomy and strengthening students' self-knowledge. These results reinforce the idea that digital innovations, when integrated into the educational curriculum, can contribute to the development of socio-emotional skills that are essential for students' personal and academic success.

However, the survey also highlighted significant challenges, especially related to infrastructure and educator training. In many schools, the lack of adequate access to technologies limits the full use of these resources, while the absence of specific training for teachers makes it difficult to adapt digital tools to socio-emotional content. These obstacles highlight the need for public policies and investments that ensure adequate infrastructure and continuous training for teachers, so that they can integrate technology in an effective and balanced way in their pedagogical practices.

Another relevant point discussed was the risk of digital addiction and the need for teacher mediation in the use of these technologies. Research has shown that while digital technologies can enrich the learning environment, it is essential for teachers to act as mediators, ensuring balanced and intentional use. Teacher mediation is crucial for digital tools to complement, and not replace, human interactions, promoting more integral learning and aligned with the proposed socio-emotional objectives.

In conclusion, this study shows that digital innovations have great potential to promote the socio-emotional development of students, especially in building resilience in educational environments. However, for this potential to be fully realized, it is necessary to face structural challenges and invest in teacher training. The research contributes to the educational field by providing directions for the balanced use of digital technologies,

suggesting that a mediated and intentional approach is essential for the impact of these tools to be positive and sustainable.

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INCLUSIVE PEDAGOGICAL PRACTICES: A PARADIGM UNDER CONSTRUCTION

https://doi.org/10.56238/sevened2024.033-003

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ABSTRACT

Inclusive education in regular education is still a recent reality that faces significant challenges, such as school exclusion and the lack of preparation of teachers to adapt content to include students with disabilities. This study aims to identify the inclusive pedagogical practices that have been adopted, discussing the role of teachers in the effectiveness of these actions, the main difficulties encountered and the importance of family participation in the inclusion process. The qualitative research is based on a narrative literature review, with data collection carried out by crossing the descriptors "inclusive education" and "regular education" in the Scientific Electronic Library Online (SciELO) database, with a filter for articles published between 2010 and 2024, resulting in 11 selected articles. The results indicate that some resources adapted and built for inclusion are relatively simple and are already available in the classroom. Thus, with some specific adaptations, it is possible to meet the individual demands of each student. Playful strategies, such as the use of games, music, painting, mobile alphabet, and other play-pedagogical resources, have been shown to be effective in promoting inclusion. In addition, the use of Brazilian Sign Language (Libras) by deaf students is highlighted as a relevant practice. The main difficulties faced by teachers include unpreparedness, lack of specialized knowledge about different types of disabilities, and practical inexperience. The absence of adequate support materials and the lack of specialized teachers for support in the classroom are additional barriers, highlighting the need for continuing education for teachers.

Keywords: Special Education. Inclusive Education. Pedagogical practices.

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INTRODUCTION

Inclusive Education in regular education is still a recent reality that has obstacles such as school exclusion and the lack of preparation of teachers to intervene or adapt the contents to include students with disabilities (Buytendorp, 2012).

As a rising paradigm, as described by Ferreira (2022), school inclusion has as its main objective to ensure that all individuals, regardless of their disabilities, differences, and needs, have access to quality education and equality; Therefore, this approach is based on the principles of equality, diversity and human rights. However, despite significant advances in this area, the effectiveness of inclusive practices in school environments continues to be a topic that demands in-depth analysis.

According to political and legislative understandings, the universalization of Education has been an endless theme and discussed with greater repercussion since the 1990s, through the dissemination of the World Declaration on Education for All (UNICEF, 1990), which must necessarily be analyzed with a view to the acquisition of effective results in the teaching process by teachers and learning by students.

To this end, still based on the principles of rights, access to the school environment must be guaranteed, including considering the differences and eccentricities of students in the process of development and schooling, and the school must be able to provide reflections on the varied needs and learning rhythms of its students, using new teaching strategies or even new curricular formatselement. Such strategies have been widely discussed both at the international level, inaugurated through postulates such as the Salamanca Declaration, and also at the national level, through the discussions aroused by the Law of Guidelines and Bases of Education, from the perspective of Inclusive Education (Neves; Rahme; Ferreira, 2019).

In this sense, the question arises: are pedagogical practices, in fact, promoting the school inclusion of students with special needs? What are the impacts of these practices on the daily lives of students with or without disabilities and their families? Ultimately, it is expected to contribute to the strengthening of inclusive education, promoting reflections that subsidize a more welcoming and equitable school environment for all students.

In these terms, the objective of this study was to identify which inclusive pedagogical practices have been adopted, discussing the role of teachers in the effectiveness of these actions, their main obstacles, in addition to emphasizing the importance of the family in the midst of the inclusion process.

SOCIO-HISTORICAL FOUNDATIONS OF INCLUSIVE EDUCATION

To investigate the aspects that touch the inclusive process in education, it is necessary to seek data on how Special Education was constituted, especially in Brazil, as well as what obstacles have been faced by teachers in pedagogical practice.

When making a brief review of the studies already published, on the constitution of the history of individuals with disabilities, a certain regularity is found in this path, that is, they describe four phases that are characterized by different ways of understanding and caring for people with disabilities (Neres; Corrêa, 2008).

The first phase of Special Education, called Pre-Christian, was marked by total ignorance about disability and its causes, which led to a complete abandonment of these people, who were persecuted and even decimated. It is known that in Greco-Roman society, people with disabilities had their destiny according to the values of the historical moment: they were killed or abandoned to their fate.

In the second phase, called the Christian Era, there is a certain ambiguity in the procedure of the question: good and evil. This dualism can be detected in the sacred book itself, which sometimes portrays disability as a "victim", which needs to be taken care of, sometimes as a "villain" presented as a divine punishment for disobedience, being the materialization of the curse. However, according to Bianchetti (1995 *apud* Neres; Corrêa, 2008), another less vehement way for the church to see and explain the existence of individuals with any type of disability, was that they were God's instruments to warn men, giving people the possibility of practicing charity.

The third phase was underlined by the Renaissance, and it was up to people with disabilities to be protected and removed, however, there was a detachment of contributory initiatives that encouraged educational attempts and scientific perspectives, which came into force in the nineteenth century, making disability transcend the idea of a moral and theological problem, becoming a medical issue, scientific and worthy to be worked on. From this period on, great advances began for studies with people with disabilities, such as the creation of schools, writings and oral methods for the deaf and/or mute, the creation of the *braille system* to facilitate reading for blind students. In addition, this phase stood out for the emergence of Special Education, which aimed at the education of people with disabilities, in order to make them productive and useful. This phase highlighted the period of institutionalization encompassed under various representations, which generated numerous ways to conceive disability, both with medical and educational foundations.

Finally, in the fourth phase, highlighted at the beginning of the twentieth century, the institutionalization movement was strengthened by the reaffirmations given by Western

countries. Through their initiatives, even though they were camouflaged, they prioritized discrimination and segregation of these people. And Special Education was seen, at first, as a medical or clinical model, where nowadays it is possible to say that they were the first to point out the need to develop educational actions for a psychiatrically hospitalized population, without even considering age or intellectual disability.

In this same period, as contextualized by Nunes, Saia and Tavares (2015), medical and psychological studies were conceived that contributed to the advent of new theories about people's aptitude and intelligence, as well as a new view on how to live with people with disabilities. Still in the course of the same century, from the institutionalization of compulsory education and the investigation of the school's inability to respond to the learning of all students, the need arose to create special rooms within regular schools, where students with learning difficulties were sent. Especially after the two world wars, there was a significant growth in schools and special classrooms.

Regarding the training of basic education teachers, Resolution CNE/CP No. 1, of February 18, 2002, which instituted the National Curriculum Guidelines, recommends a series of parameters to be considered in the pedagogical projects of teacher training courses (Brasil, 2002). Therefore, Higher Education Institutions must include in their courses a teacher training that enables the attendance of ethnic, social, cultural, political and economic diversities, thus covering the necessary knowledge about people with special educational needs.

In the face of this new educational prototype, proposed by Secundino and Santos (2023), in which students with disabilities have won the right to attend regular schools, the demands on teachers are increasing, who need new positions that involve an effort to update and reorganize the current conditions for teaching.

Thus, in the current context, based on the perspective of these authors, it is necessary to break with the fractional view that one has of the teacher's training, as it is a development, which essentially must be continued, especially when referring to Special Education.

CONCEPTS AND LEGISLATION

In the studies of Buytendorp (2012), two remarkable historical moments can be highlighted in the change of prototype that marks inclusive education: the "World Conference on Education for All", which took place in 1990 in Jomtien, Thailand, and the "World Conference on Special Educational Needs", in 1994, in Salamanca, Spain, which gave rise to the Salamanca Declaration.

Nunes, Saia and Tavares (2015) point out that, in the first moment, education appears as a global concern and, in the second, the declaration was approved with the following objectives: the recognition of differences, meeting the needs of each one, the training of teachers, the progression of learning and the approval of the importance of "school for all".

The purpose of these documents is to defend the urgency of educational reform, in order to ensure that all students, including those with disabilities, are enrolled in regular schools and, in this way, education is within everyone's reach. The use of the descriptor "special educational needs" is based on the World Declaration of Salamanca (1994), which states in its articles the intention that inclusive postulates should include all students, who for various reasons find themselves in unfavorable situations in the schooling process.

International discussions on the School for All movement and the Salamanca Declaration have contributed to giving a real meaning to the word inclusion. This movement had repercussions in Brazil, with the implementation of the Law of Guidelines and Bases (LDB) of 1996, directly interfering in state and municipal legislation. In this period, there was a growing debate about dissatisfaction with the social and educational system, intending to rescue a reflection in the search for the removal of the vision of integration as a responsibility only of the person with disabilities, leaving society exempt from this process, and this principle became "resist any type of exclusion".

In fact, Jannuzzi (2005) states that since the first constitution there was already talk of education for all. As this was not envisioned in practice, constitutional amendments were created excluding from this whole, subjects who, for reasons of health or disability, were unable to attend school. The author points out that in the 1960s the great reference was that individuals with disabilities themselves began to fight for their rights, a movement that came to be known as self-advocacy.

TEACHING AND LEARNING PROCESS IN THE INCLUSIVE PERSPECTIVE

From the nineteenth century onwards, Capellini and Mendes (2021) point out that great discoveries occurred in the fields of medicine, biology, and health, which began to study people with disabilities in order to seek answers to their problems. From this perspective, the educability of such individuals was limited to the initiative of the medical area, usually taking place in religious or philanthropic institutions, with government consent, however, without any type of involvement of the public power.

In this way, "inclusion" proposes, from the beginning, not to exclude anyone from regular education. The emphasis on inclusive schools is the construction of a system that

guarantees the permanence and development of each one. In this aspect, it is believed that, in order to facilitate the learning of all students, it is important for the teacher to reflect on the differences between students as a resource capable of enriching educational activities. On the other hand, the difficulties experienced by the student can also contribute to the advancement of teaching practice, since learning consists of giving a meaning of one's own to experiences.

The prelude to inclusion begins to plead for a new school and a new society, with different attitudes and postures, in order to guarantee the right to access and permanence in school and the right to be different without being labeled, discriminated against or segregated.

In this context, there are many aspects that still hinder the achievement of school inclusion. One of them is the educational approach established in the student's problems, still used by many schools. When this happens, it is assumed that, due to their disabilities, the child needs special education and that they will perform better if inserted in environments where others have similar difficulties or disabilities**.**

Consequently, there is no enthusiasm for teachers of regular classes to make an effort or dedicate themselves to students who have special needs. Teachers may even judge themselves unfit, since teaching children with special needs is a task for special education specialists.

According to Oliveira (2002 *apud* Capellini; Rodrigues, 2009), many teachers exempt themselves from any responsibility, blaming the socioeconomic and cultural environment, justifying that the incapacity is in the student or, even, that he is not dedicated or does not make an effort to learn what he is taught.

Therefore, believing that special classes or special schools will always be the best choice for children with disabilities means repressing their learning processes in an inclusive way, whether by adapting the material given in the classroom or in the teacher's own speech, because, as Silva and Carvalho (2017) point out, differentiated communication grants not only exposing information to students, as well as allowing teachers to understand what the student inserted in a regular education, in a school environment in the classroom desires and, in turn, ends up allowing him to communicate with his teachers and other employees of his school.

METHODOLOGICAL PROCEDURES

This qualitative study is a narrative literature review, and data collection was carried out by crossing the descriptors "inclusive education" and "regular education", in the

scientific database *Scientific Electronic Library Online* (SciELO), with a filter for articles between 2010 and 2024. A total of 36 articles were located, whose abstracts were read, and 21 were selected because they dealt with themes pertinent to the proposed objectives, excluding those with only cross-cutting or duplicate themes. The papers are presented in the table below in descending order by date of publication:

Table 1 - Publications retrieved by year of publication

	Year of publication	Title	Authors
1	2023	Interaction between Special Education and Regular Education: pedagogical actions for blind students.	Lúcia Virginia Mamcasz-Viginheski, Lucia Eliziane de Fátima Alvaristo and Elsa Midori Shimazaki
2	2023	The influence of ableism on Decree No. 10,502/2020 and on the text of PNEE 2020.	Bianca dos Santos Soares and Iara Pereira Ribeiro
3	2022	Experiences, Perceptions and Conceptions of Students with Visual Impairment in Mathematics Classes: the challenges underlying the process of school inclusion.	Fábio Garcia Bernardo
4	2021	Trajectories of Students with Disabilities and Inclusive Education Policies: from Basic Education to Higher Education.	Maria Cecília Alvim Guimarães, Adriana Araújo Pereira Borges, Adriana Maria Valladão Novais Van Petten
5	2020	Teachers' Conceptions of the Inclusive Education Policy: A Case Study.	Marcelo Domingues Roman, Elaine Soares da Silva Molero and Carla Cilene Baptista da Silva
6	2018	Inclusion of Students with Disabilities in Physical Education Classes: Attitudes of Teachers in Regular Schools.	Marcia Greguol, Bruno Marson Malagodi, Attilio Carraro
7	2015	Inclusive Education: Between History, Prejudices, School and Family.	Sylvia da Silveira Nunes and Ana Lúcia Saia and Rosana Elizete Tavares.
8	2015	The Negotiation of Signs in Libras as a Possibility of Teaching and Learning Geometry.	Elielson Ribeiro de Sales, Miriam Godoy Penteado and Amanda Queiroz Moura
9	2015	Teaching Strategies and Pedagogical Resources for the Teaching of Students with ADHD in Physical Education Classes.	Camila Rodrigues Costa, Jaqueline Costa Castilho Moreira, Manoel Osmar Seabra Júnior
10	2014	Training of Educational Agents: Proposal for the Development of Inclusive Strategies.	Priscila Benitez and Camila Domeniconi
11	2014	Continuing Education: Analysis of Teaching Resources and Strategies for Inclusive Education from the Teaching Perspective.	Viviane Preichardt Duek
12	2013	Schooling Processes for People with Visual Impairment.	Carla Ariela Rios Vilaronga and Katia Regina Moreno Caiado
13	2012	A Study on Teaching Relations in Inclusive Education: Evidence of the Possibilities of Development and Learning.	Ana Paula de Freitas

14	2012	Teacher training through collaborative research with a view to the inclusion of students with intellectual disabilities.	Elizabete Humai de Toledo and Célia Regina Vitaliano
15	2012	Teachers' conceptions on the theme of the so-called learning difficulties.	Jáima Pinheiro de Oliveira, Sabrina Antunes dos Santos, Patrícia Aspilicueta and Gilmar de Carvalho Cruz
16	2011	Inclusive Education and the Training of Science Teachers: The Role of Federal Universities in the Training of Future Educators.	Mayara Lustosa Oliveira, Adriana Maria Antunes, Thiago Lopes Rocha and Simone Maria Teixeira
17	2011	Inclusive Education and Students with Mental Disorders: An Interdisciplinary Challenge.	Antonio Carlos Gonsales Sanches and Márcia Aparecida Ferreira de Oliveira
18	2011	Inclusive education: Analysis and intervention in a resource room.	Marileide Antunes de Oliveira and Lúcia Pereira Leite
19	2010	Inclusion of Children with Down Syndrome and Cerebral Palsy in Elementary School I: Comparison of Reports of Mothers and Teachers.	Clara Regina Abdalla Ferraz, Marcos Vinícius de Araújo and Luiz Renato Rodrigues Carreiro
20	2010	Teacher Training for Higher Education: Teaching Practice with Students with Visual Impairment.	Michele Xavier dos Reis, Daniela Aparecida Eufrásio and Fernanda Vilhena Mafra Bazon
21	2010	Social Interaction of Children with Down Syndrome in Early Childhood Education.	Patrícia Páfaro Gomes Anhão, Luzia Iara Pfeifer and Jair Lício dos Santos

Source: prepared by the authors (2024).

Through the localized works, it was possible to identify positive aspects regarding the path of school inclusion, but also many difficulties, not being, therefore, divided into categories for discussion, but starting from discussions that intertwine the duality faced during the process.

It begins with the study by the author Duek (2014), pointing out that activities modified by teachers to teach a student with Cerebral Palsy (CP) were identified, such as changes in the use of music, painting, cutting, or even fitting games; an example of this was the fact of asking the other students to put the letters in their respective order, but for the student with CP, the teacher used the mobile alphabet so that she could locate, identify and paste as requested.

Another student who seemed to have learning difficulties, since he could not understand the letters of the alphabet and, consequently, could not relate the words with their respective graphemes, due to the teacher's perception, a differentiated pedagogical strategy was carried out, stating that from his name, she helped him to know the letters. This contributed to his being able to identify his name and recognize other consonants, in addition, the teacher assured and transmitted a look of confidence so that he had autonomy to further guarantee effectiveness. Through these two reports, a teacher was able to think of

a class that both creates enthusiasm for her students and correlates with their difficulties, but it is also described that there are difficulties for teachers in reconciling the attention given to students with CP with other students without disabilities.

The same study also pointed out, a teacher who had a student with Intellectual Disability (ID) and through her attentive eye, realized that the child loved to be praised and liked to perform. By recognizing her attitudes, she was able to work with the appreciation and expansion of the skills and knowledge that each student presented, but also, she made available several resources and materials involving the reading, restructuring or interpretation of texts, in which they were motivational elements for the student, managing to include her in the activities. To the student with ID, it is highlighted "that the teacher must intervene so that the student can confront and resolve cognitive conflicts" (Toledo; Vitaliano, 2012, p. 330), since this contributed to the student interacting more in class and positively improving her behavior.

In the conceptions of physical education teachers about the inclusion of students with disabilities, Fiorini and Mazini (2015) identified difficulties in adapting teaching strategies. In many cases, there was a predominance of individual activities for these students, to the detriment of collective activities. The main difficulties mentioned include the lack of support materials, the absence of assistants to assist in classes and the lack of experience in working with students with disabilities.

From this perspective, teachers can work around it by acting through play, since the student "learns to put his curiosity into practice, acquires initiative, self-confidence, develops language, thought and concentration" (Costa; Moreira; Júnior, 2015, p. 113).

Also noteworthy is the training of professionals in these areas, who often do not receive adequate information about the students' disabilities, as well as their true limitations and potentialities. In this sense, it is emphasized that valuing School Physical Education, combined with continuing education and the support of a multidisciplinary team, can be fundamental to consolidate it as a strategic area in inclusive education. This transforms Physical Education into a privileged field for experimentation, innovation and improvement of pedagogical quality in schools.

During the classes of this discipline, one of the teachers created a survey about which games and games the students liked and/or knew the most, so that they could experience it in the practical classes. And this contributed to the teacher being able to free herself from anguish and do her best to also include students with disabilities. In addition, this same teacher pointed out some adaptations to be made so that everyone could participate in the same game, that is, changing the basketball hoop for a hoop, lowering the

nets or volleyball ropes, adapting recreational activities such as changing movements for those who have some disability or motor limitation to perform.

Vilaronga and Caiado (2013) highlighted the school experiences of students with Visual Impairment (VD) or low vision, in which some of them reported how teachers used simple pedagogical practices, but significant to them, such as the use of loud voices, so that they could copy what was written on the chalk board and others even wrote with a larger size, seeking to facilitate the understanding of students with this type of disability, in the same way as it occurred with young people in mathematics classes according to data from Bernardo (2022).

The study by Mamcasz-Viginheski, Alvaristo, Shimazaki (2023) showed that the use of mediating teaching instruments, such as the use of the *soroban* - the Japanese abacus - oral or transcribed in Braille assessments, is validated for the teacher. In addition to the fact that, to the pedagogical practices in this perspective, adaptations were made to the mathematics materials and the use of logical cushions, or with different textures, this adaptation was even placed in games that develop autonomy, in addition, these modifications were consulted with the support teachers who were requested from the fixed teachers.

From this perspective of simplicity in practices, the teacher of Freitas' study (2012), made indicative gestures to help all students understand storytelling, however, she had to modify it so that the student with ID could pay attention, such as the modification of the intonation of the voice, elaborate questions to create suspense, gesticulated much more, working in general on language and this contributed to the child with disabilities feeling interest and focus on the narratives.

Likewise, the authors Pedrinelli and Verenguer (2013 *apud* Greguol; Malagodi; Carraro, 2018) point out that over time, the way school physical education teachers perceive their work with people with disabilities has been significantly transformed. Still recent, this practice of physical activities for this population was considered an exclusive responsibility of physiotherapists or occupational therapists, in addition to the fact that physical education courses in higher education began to incorporate specific knowledge about people with disabilities only in the early 1980s.

According to Rodrigues (2003 *apud* Greguol; Malagodi; Carraro, 2018), physical education at school should be ensured as a student's right and not placed as an option to be discarded. Therefore, physical education in schools should be guaranteed as a student's right, and not treated as a mere option that can be eliminated. In this way, no student should be exempted from the discipline, even if it is only in relation to its theoretical content.

On the other hand, in art classes, as much as teachers use different pedagogical resources such as dance, music, poetry and drawings to facilitate student learning, they indicate that there is still a lot of disrespect in individual differences and in pedagogical strategies or in the resources there was no concern about the interests of students with CP.

To students with Autism Spectrum Disorder (ASD), a teacher requested the help of a support teacher, because the student, in addition to being restless, brought games of her interest, which contributed negatively to her development in classroom activities, which consequently remained unchanged, emphasizing how important it is to consolidate the roles of both teachers to work with the student with disabilities.

The authors Briant and Oliver (2012) pointed out that teachers had to modify their pedagogical practices through adaptations of school material, such as thickening pencils, using concrete objects to facilitate comprehension or recreational activities such as learning colors through games or storytelling with students with or without disabilities.

Regarding the counting of narratives, in the analysis of Oliveira and Leite (2011), they point out that in resource rooms, teachers already wanted to carry out readings, interpretations and text productions with the intention of minimizing the learning and literacy difficulties of students who had fallen behind or the use of play-pedagogical resources, however, there was no mention of which materials were used.

On the other hand, the difficulties of creating inclusive adapted activities are shown, so much so that they used materials from students with learning problems or content gaps that would be for children with disabilities or Down Syndrome (DS), as pointed out in the research by Ferraz, Araújo, Carreiro (2010). However, in order to create a truly inclusive environment, Greguol, Malagodi and Carraro (2018, p. 35) propose that changes "in the organization of initial and continuing teacher training, together with a more effective school administrative structure, can be factors that contribute to the development of more positive attitudes on the part of educators".

To students with Hearing Impairment (DA), they show that it is essential for the teacher to be equipped with the Brazilian Sign Language (Libras), indicated by the authors Sales, Penteado, Moura (2015) and Guimarães, Borges, Van Petten (2021), facilitating the understanding of curricular content, highlighting that one should not consider only one characteristic of the disability and overshadow the others, they would be in a way disregarding the subject.

The first three authors also presented relevant aspects about deafness and fundamental principles to consider the education of deaf people, as well as excerpts from

the interactions that took place in the classroom and about the importance of Libras in the teaching and learning process of the mathematics discipline.

It is worth mentioning that deafness is not an intrinsic problem and in reality, all human beings are born with hearing abilities that vary in degree and intensity; Some have a decrease in hearing, while others face a greater loss, above all, the real challenge lies in the way society interacts and relates to deaf people.

The deaf perceive the world through other senses, such as smell, touch, taste and, of course, sight. These senses allow the sensations of the world to be experienced through pathways that are not affected by hearing loss. According to Sacks (1998 *apud* Sales; Hairdo; Moura, 2015, p. 1271), in addition to the traditional senses, accessory senses should be considered, such as the example of a student with profound deafness, was to rest a finger on the piano key and recognize it as a dominant chord or interpret highly amplified voices in phone calls. It is also noteworthy that the environment created by the resolution of auditory problems and the teaching of geometry, using Libras and visual resources, established a favorable communication channel and allowed students to interact both with their colleagues and with the group, facilitating the appropriation of mathematical concepts related to the content covered.

This discussion was based on an interaction with students who communicate in Libras and are able to read in Portuguese. The negotiation of some signals stands out, which proved necessary during the conversation about Geometry, the topic that was being studied. That said, difficulties were found to find a sign of the language that corresponded to what was being covered or the absence of specific signs, to represent some elements of geometry, which could have been an obstacle to the communication process in the classroom. However, this situation seems to have contributed positively to the students' involvement with the proposed activity.

It is worth noting that the teachers of the studies carried out by Reis, Eufrásio and Bazon (2010) point out that, in order for the inclusive process to occur, teachers need to be prepared, facilitating "the perception of what is the effectiveness of school inclusion in the view of those who experience it" (Soares; Ribeiro, 2023, p.12). Although Inclusive Education centers on the universalization of education, it is notorious that everyone has the right to a quality education that seeks to welcome and accept individual differences. Through this perspective, it is noticeable to note the growing challenges in the face of the multifactorial difficulties arising from this inclusive process, in which these are "individual, parental, school and social factors." (Oliveira *et al*., 2012, p. 95).

Theoretically, the performance in inclusive classes does not consider the emotional preparation of teachers, which is a dimension often neglected in the training of these professionals (Faria; Camargo, 2018) and the need for more trained professionals for students with disabilities emphasized by Sanches and Oliveira (2011), in addition to highlighting the lack of knowledge, absence of adequate training, insufficient support and disregard for the severity of the disability, these being the main obstacles on the teaching side pointed out by Greguol, Malagodi and Carraro (2018).

In addition, the excessive emphasis on cognition at the expense of emotion reflects a Cartesian pattern that has historically permeated the educational system, marginalizing and ignoring emotion, affirms that the old and misleading idealization that emotion and reason are independent and exclusive attributions still prevails. Therefore, it is not unexpected that for many teachers, emotions and feelings are still seen as threatening learning, and as such, must be controlled, stifled or ignored.

Consequently, the importance of emotional factors in the teaching and learning process of professionals who work with people with disabilities is emphasized; therefore, the teacher's performance must take into account the elements that arouse emotions, as these are the main drivers of learning, since Tezani (2004 *apud* Oliveira *et al*. 2012, p. 103) stresses that "pedagogical and administrative restructuring in the process of school inclusion" is indispensable.

Thus, the school cannot focus only on cognitive development: "the emotional aspect of the individual is no less significant than other aspects and must be an educational concern in the same proportions as intelligence and will" (Vigotski, 2004 *apud* Faria; Camargo, 2021, p. 4).

Although the school and teachers have relevant roles, the family is also an essential point for the inclusive process (Menino-Mencia *et al*., 2019); it is worth mentioning that, generally, the illness of a family member generates a strong shock, so they must be issued in the face of a collaborative partnership through attitudes such as communicating with professionals, in addition to respecting and questioning them appropriately, participating in activities and meetings.

Benitez and Domeniconi (2014) point out that the family member also needs to be understanding and elaborate the minimum of tips during the learning of the person with disabilities and praise each correct answer, thus contributing to support and motivation. And it is through these contributions that they help in the inclusion process and help to "maintain adequate expectations" (Ferraz; Araújo; Carreiro, 2010, p. 403). On the other hand, the parents of those with disabilities also have their concerns, for example, with the

development of their children's learning and fear how they will progress, either positively or negatively.

Finally, it is worth noting that the theme of inclusive education is often listed by vagueness and obstacles that are presented in the school routine, even though the clarity in the legislation is apparent (Roman; Molero; Silva, 2020) and the collaboration between parents and teachers can be seen as a promising strategy for the development of the school inclusion process, in addition to favoring the teaching of academic skills to students with disabilities.

Reinforcing that most of the public of the studies is children, it is worth concluding that regardless of their "physical, sensory, cognitive or emotional conditions, they are children who have the same basic needs of affection, care and protection, and the same desires and feelings as others" (Anhão; Pfeifer; Santos, 2010, p. 43) people without disabilities.

FINAL CONSIDERATIONS

Through this literature review, it was possible to perceive inclusive pedagogical practices arising from existing resources that were modified so that it is possible to work with students with special educational needs, such as the expansion of texts, modifications in traditional sports and recreational activities, or the use of indicative gestures for the effectiveness of the role of teachers. Therefore, some of the adapted and built resources are simple and are already available in the classroom, so with some modifications made they are specific and meet the demands of each student in particular.

Strategies used in Physical Education classes, with the objective of including all students, especially those who have some disability, taking into account the games and games preferred by the class. The ludic in the classroom, such as the use of games, music, painting, mobile alphabet among others, the use of mediating instruments and playful pedagogical resources.

It is noted the use of the Brazilian Sign Language by deaf students in Mathematics classes, as a facilitator of the learning of the proposed contents, to later insert the teaching of the language of the hearing community, as well as the role of the school as an environment conducive to the construction of the visuality of blind students.

It is also observed that simple strategies adopted by teachers, such as the use of a loud voice and a confident look, can significantly help in the teaching and learning process of students with disabilities.

However, it was also possible to verify that the difficulties of these professionals range from unpreparedness, due to the lack of specialized knowledge about disabilities and practical inexperience, to experiences with school exclusion, due to anguish and lack of emotional preparation to deal with students and their special needs. From this perspective, it becomes challenging to perceive students with disabilities in their school reality, as their identity cannot be restricted to a single characteristic. This limited view ends up overshadowing their other qualities and limitations, not considering the student as a whole. The lack of adequate support materials, the absence of specialized teachers who can offer support during classes, are also barriers that can negatively impact the teaching and learning process.

It is worth mentioning that the family also plays an important role in the inclusive process, since the life of the person with disabilities begins with the family and this is influenced in a positive or negative way and when people with disabilities are placed in educational environments, a collaborative partnership with the professionals who will educate their children or relatives becomes necessary.

Therefore, public policies will be needed that support and enforce the needs of each student with disabilities, in addition to permanent continuing education training for teachers and managers who work in inclusive education.

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TEACHING GEOGRAPHY FOR SUSTAINABILITY AND THE ENVIRONMENT

https://doi.org/10.56238/sevened2024.033-004

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ABSTRACT

Geography, education for sustainability and specifically geographic education for sustainability are called to respond to a demand with profound social, economic and environmental connotations: globalization, climate change, human development, diversity (biological, socioeconomic and cultural), sustainable development, which involves not only the individualization of interrelationships, but also the positioning in an ethical dimension and solidarity with the new generations. Thus, the general objective of this work is to present a study on what are the contributions of geography to education and sustainable local development. The following work is classified as a literature review, in which a search was carried out to books, dissertations and scientific articles selected through a search in the following databases (books, database sites, etc.): Scielo, CAPES Portal and Google Academics for the investigation. The keywords used in the search were: "environmental education", "sustainable development" and "geography". to teach Geography is to commit oneself to the formation of the citizen, taking into account Vygotsky's socio-interactionist conception defended by the authors studied. Teachers, with regard to this human science, need to rely on other professionals in the area to guide them, improving their work with the contents that involve the discipline. It is also very important that the departments of education provide better courses and resources so that teachers can do a satisfactory job in this discipline totally in harmony with the environment in which the students are inserted.

Keywords: Sustainable development. Sustainability. Geography Teaching.

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INTRODUCTION

The school fulfills the duty to play a formative and developmental role in society so that these institutions prepare people to be "free" and capable adults tomorrow. The school must transmit knowledge, values and healthy habits so that they are integral people, responsible for their actions and capable of solving life's problems.

There are numerous social functions that are present in the school, educational centers and others. These environments are nothing more than a combination based on the social reality of the "adult world" with order, hierarchy, established norms, goals, etc. This form is part of the social whole. The school plays a formative role in society; prepare the adults of the future, transmitting knowledge, habits and values to be useful, efficient and happy members (DE OLIVEIRA; DA SILVA; GONÇALVES, 2020).

It is the school, the family, the most important place for the socialization of the individual. It is the area where he will learn to share, to limit himself, to discover the world around him and where he is building his identity. You will get to know your place in the world, the history of your community, the development of science; and in the case of a person, they will learn to fight for their rights and must fulfill the obligations arising from the rules, which temper their character when entering the adult world.

The school is a social union, necessary and convenient for the adaptation of new members to its midst, and it is a means that allows social mobility among the members of free societies, allowing the progress of the most intellectually and civilly trained. I should even give equal opportunities to all students, financially supporting those who are most disadvantaged in this regard.

The integration between scientific and educational knowledge, applied to local problems, is a necessary process for the development of the goal of sustainability. For this, a convergence of geographic and educational subthemes is necessary that allow the interrelated study of the global and local environment.

There is a growing awareness of the conflict between the tasks of human beings and the fragility of the environment. Natural resources, instead of being exploited in many regions of the planet, will have to sustain an economy that in a relatively short period of time can be five to ten times larger than the one that currently exists. This cannot be achieved if humanity continues to carry out the same activities within current consumption patterns.

In this context, Geography, education for sustainability and specifically geographic education for sustainability are called upon to respond to a demand with profound social, economic and environmental connotations: globalization, climate change, human development, diversity (biological, socioeconomic and cultural), sustainable development,

which involves not only the individualization of interrelationships, but also the positioning in an ethical and solidary dimension with the new generations (SILVA; GRYBOVSKI, 2019).

Thus, the general objective of this work is to present a study on what are the contributions of geography to education and sustainable local development.

The following research is classified as a literature review defined by Gil (2008) as one that uses texts (or other printed or recorded intellectual material) as primary sources to obtain its data. It is not only a collection of data contained in books, but, on the contrary, it focuses on the innovative and critical reflection of certain texts and the concepts raised in them, in which a consultation of books, dissertations and scientific articles selected through a search in the following databases (books, database sites, etc.) was carried out. The databases used in this investigation were: Scielo, CAPES Portal and Google Academics. The keywords used in the search were: *"environmental education*", *"environment",* "*sustainable development*" and "geography".

EDUCATION AND LOCAL DEVELOPMENT: CONTRIBUTIONS OF GEOGRAPHY

The teaching professional is responsible for the teaching-learning process, which takes place in different formal educational institutions. The function that the teacher performs has characteristics that are specific to his profession, to the way of teaching, its importance and the demands of what is expected of the teacher in the face of the challenges and uncertainties in the contemporary world, that is, as a profession, teaching presupposes training for its exercise.

However, the teacher's work, as an agent of education, when well directed and with well-established guidelines, acquires an educational, instructive nature, capable of awakening in the student the ability to seek knowledge hitherto unknown, conducted only by the conscious guidance of the teacher (GOMES; PEDROSO, 2022).

According to Monteiro (2015), a good teacher should remain where the staff and the public meet, dealing with the fantastic flow of traffic at an intersection where intertwining a network of connectivity is more like an attempt to cross a highway on foot.

The teaching work involves the complex process in the relationship between teaching and learning. We understand teaching as a complex, historical social practice that is determined by human society. According to Monteiro (2015), teaching as a social practice needs to be problematized, understood and transformed, enabling dialogue resulting from the relationships between teachers and students.

Society is a horizon where groups emerge, develop their own lives and share their goods. If education is dialogue, encounter and communication of one subject with the other,

where the educator and the student educate each other, and if man is only fulfilled to the extent that he is a being with the other, and if the school, in a certain sense, institutionalizes this social and practical character of human nature, it cannot be seen as an isolated and artificial space. It is not the school that brings together students and teachers, but the need for education that gives rise to the school. The understanding of this phenomenon explains and substantiates the community meaning of the school and its relations with the regional context (DE OLIVEIRA; DA SILVA; GONÇALVES, 2020).

Since the Federal Constitution of 1988, school management must be democratic and participatory in favor of the exercise directed to the people. In its article 206 of the Magna Carta, the pluralism of ideas and pedagogical conceptions and the democratic management of education are established as "basic principles" (BRASIL, 1988). Therefore, the principles considered in Democratic Management must be focused on decentralization, which includes non-hierarchical forms of discussion, decisions and different actions.

It is necessary that everyone involved in the internal and external daily life of the school participates in the management, from teachers to the community that exists around the school. Only in this way does democratic management achieve transparency, since each and every decision or action made in the school has to be known to all.

Democratic management seeks the autonomy of the school in three major areas: financial; the administrative; and, the pedagogical. For Gadotti (1994), democratic management is important, and, above all, fundamental to promote general improvements in education. For him, as the school should train for citizenship, it should set an example.

Democratic and decentralizing processes encompass a different definition in the current century, having a centralization in relation to contextual specificities within school situations. According to Libâneo (2008), people begin to have responsibilities for their competence and ability to survive, and a new individual emerges in this changeable society who needs care and rights. According to the author:

> The democratic public school, therefore, should be understood here as a place to expand educational opportunities, disseminate knowledge and its critical re-elaboration, improve school educational practice aiming at the cultural and scientific elevation of the popular strata, contributing, at the same time, to respond to their most immediate needs and aspirations and to their insertion in a collective project of change in society (LIBÂNEO, 2008, p.46).

In this sense of encounters and disagreements regarding public policies, it is perceived that there are paths that contradict each other, in the historical series of public administration, accusing that social and cultural movements have changed traditions and changed the course of this path.

Management similarly fosters the emergence of representative bodies, such as school unions, parent-teacher associations. It is believed that in this way, with an agreement between representative units, the activity becomes more democratic and effective. The management also fosters the creation of representative bodies, such as school unions, parent-teacher associations. It is believed that in this way, with an articulation in representative units, participation becomes more democratic and efficient.

The educational issue, globally, has the social attribution of generating the development of specific capacities of the human being. The human being, being a cultural entity and having its values, needs a place for socialization. However, there is a socially tense experience, in the same way, which needs to have respect for diversity, needing to follow equal rules for all, it is necessary to make a joint effort through participation (GOMES; PEDROSO, 2022).

It is worth mentioning that community is understood as the neighborhood, life, associations, societies, institutions. Implicit in the concept of community is a certain degree of solidarity, cultural integration, action and feeling of reality, and even certain geographical, economic and historical aspects (VIEIRA, FARIA, 2019).

It is a fact, then, that the centralization that still prevails in most school units needs to give way to decentralization so that the community has more autonomy and starts to act in a way that will benefit everyone. The problem persists because the State and the Municipality themselves do not work with the idea of cooperation, when it comes to managing schools.

Thus, we can only examine the relations between the school and the community to the extent that we inquire about the role of the school in relation to the conflicting elements that weave the relations of the community itself. In this same perspective, we can question how and who represents the community in the school. In a more direct way, the question is the following: does the school serve the interests of some or all members of the community? In fact, most of our schools reproduce the society in which we live, that is, they serve only a part of the community (VIEIRA, FARIA, 2019).

To the extent that the school is unaware of the experience and thought of the student and the community, it can only act as if it had a monopoly on knowledge. The pedagogical posture becomes authoritarian and, in general, purely verbalist. Without cultivating reciprocity, the essential exchange of the entire act of learning, imposes on the student the dominant worldview (GOMES; PEDROSO, 2022).

A school without the physiognomy of a community, without eyes, hands, arms, in short, without a body capable of feeling the external world, cannot communicate knowledge, experiences, cannot become a cultural center and without its own identity, specific

objectives and political guidelines, it can leave its mark on the student and its influence on the community.

An institution truly integrated into the environment has the function of analyzing and evaluating the very conditions of this environment, its internal and external relations. In addition to the changes in attitudes of the members of the school community, where some people cannot impose everything on others, they cannot be the origin of all ideas and decisions. It is necessary to bear in mind that education is not limited to teaching itself, and this is not reduced to the so-called scientific knowledge. Knowledge takes several forms: common sense, art, religion, technology, science, etc. (VIEIRA, FARIA, 2019).

Knowledge in its various modalities, and even in the form of culture, can be developed through activities such as theater, music, cinema, visual arts, dance, reading, and also effective means of exchange of ideas and experiences between the school and the community. These activities allow the participation and coexistence of the student with parents, colleagues, authorities in a more direct way (GOMES; PEDROSO, 2022).

They provide a longer permanence of the student in school, preventing them from moving to other parts of the city, as happens today with those who want to improve their creative potential, and who attend formal education for one period, in one school, and, in the other period, study languages, ballet, music in other establishments.

In reality, activities mistakenly called extra-class are fundamental in the educational process. Through these extension activities such as short courses, lectures, games, etc., people from the community, from all social and intellectual levels, can contribute with their opinions, experiences, skills for debate and the deepening of knowledge for the full realization of the functions of education.

CONTRIBUTIONS OF GEOGRAPHY TO THE ENVIRONMENT

The national curriculum parameters (1997) indicate that the objective of teaching Geography should enable the student to exercise citizenship, permeating the feeling of belonging to a reality in which the relations between nature and society form an integrated whole (BRASIL, 1997).

To study Geography is to think and understand the environment in which it is inserted: the contemporary world, it is to situate oneself, position oneself and act as a transforming subject in a rational and critical way.

> (...) Geography should enable students to have autonomy, understanding, limits and the potentialities of science and technology, as well as the developments that such development has brought in the construction of geographical spatialities. (BUENO, 2004, 90)

The new reflections linked to the teaching of the discipline in question undo the simple descriptions of places and numerical data which were priorities in traditional education. Current teaching should make the student understand the geographical space in its totality. Cavalcanti (2010) says:

> As for the pedagogical-didactic aspects of the proposals for teaching Geography, the belief persists, explicit or not, that in order to teach well, knowledge of the content of the subject critically focused is enough. (CAVALCANTI, 2010, p. 78).

According to this reality, it is necessary to review the attitude of many teachers who, when feeling insecure in the insecure teaching process, tend to a conservative attitude, and choose to perform various routine activities in the classroom, being afraid of discovering new paths, new pedagogical practices (DE ARAÚJO, 2021).

Spegiorin (2007), concluded:

> Such actions can reveal new teaching possibilities, which would possibly not be developed without a more voluntary mediation and less involved with routine procedures, students must create, discover, explore and enable new learning and be in a constant process of learning and discovery (SPEGIORIN, 2007, p.30).

Teachers, then, must have a vision of greater practicality, develop their classes in a meaningful way, favoring the learning of the contents they teach, involving students. It is necessary to intentionally articulate their professional and social projects, favoring the breadth of each one.

Also according to the PCNs (1997), when the student is led to think about geography, he acquires a subjective understanding of the landscape as a place, since it starts to have meaning. They are perceptions responsible for establishing part of the process of construction and representation of the environment in which we live, which are essential for geographical knowledge.

Thus, among the different roles attributed to geographic education today, there is the perception of space and everything that this space can determine for people. According to Matias (2006) the following definition is given:

> Geographic education has many objectives, among them, the importance of the transformation of space and its impact on the daily lives of citizens stands out. Perceiving this dynamic of change in geographic space is extremely complex, given the multiple relationships and areas of knowledge involved in this process. Thus, the great challenge of Geography in a dynamic society is to make geographical knowledge a significant instrument for social transformation and the student, being the central agent of this teaching and learning process, transforming knowledge into a daily tool (MATIAS, 2006, p. 250).

Understanding the relationship between Geography and spatial orientation skills is the purpose of this social intervention project. In other words, it is intended to know how and at what moments geographical knowledge helps citizens in their socio-spatial practice. Before that, it is necessary to observe that the current school practice demands recognizing the student as a sociocultural subject, and it is necessary, then, to ascertain their cognitive and psychological development, perception of space and language (MONTEIRO, 2015).

It is notorious that, with these perceptions, the educator will be able to invest in teaching strategies that diagnose the spatial knowledge that the student has. Knowledge about space, as spatial perception, is directly fundamental in the construction of geographical knowledge. It is through it that man, in society, has the ability to establish relationships that demarcate the social, cultural, technological, economic and environmental context.

When teaching, the teacher must act as a mediator in the students' learning process; must stimulate and motivate, provide criteria and diagnose learning situations of each student and the whole class, clarify and provide values and help students develop their own, finally, must promote and facilitate human relations in the classroom and at school, and be their personal and professional advisor.

Given the current educational demands, the teaching work will be reoriented towards a tutorial attitude, similar to that of the coordination, advice and facilitation of educational experiences in which the student can learn. Likewise, in classrooms, a climate of free expression will be privileged and educational experiences will be initiated by the planned, intentional, and significant use of the issue as an activator of integral processes (DE ARAÚJO, 2021).

If pedagogy is a reflection on the practice by which the new theory is constructed and the practice is modified, becoming practice, then geographic pedagogy reflects on the formation of the student of geographical knowledge, on what geography teaches in each of the forms of education (Formal, non-formal and informal), on the teaching of geography, it is to indicate identified and selected subjects, problems, the aspects of geography should be taught in basic education and at each level of schooling, of education. Pedagogy reflects on the characteristics of training and the specificities of the geographical discipline that should be taught to basic education teachers, on the singularities of culture and on the cognitive, social, affective and intellectual characteristics of population culture (MONTEIRO, 2015).

In other words, collaborating with the MEC Portal (BRASIL, 2010) on the teaching of geography concludes that:

> Therefore, teaching geographic contents, with the contribution of school knowledge, requires a lively, true dialogue, in which everyone, students and teachers, have the legitimacy to manifest themselves, based on the debate of really relevant themes and the confrontation of perceptions, experiences, analyses, seeking a real meaning of the contents studied for the students (BRASIL, 2010, p. 03).

It is evident that contemporaneity, especially with regard to the teaching of geography, points to the globalization process as a guide for the teaching-learning relationship. It is necessary to consider, however, that this process is complex, given the number of several participating countries and, given their differences, this aspect does not denote social justice or overcoming social inequalities.

When making considerations about the globalization process, Cavalcanti (2010) argues that:

In this process, there is greater interdependence between the scales at which spatial phenomena and facts occur, greater and more intense communication between people, companies and institutions, leading to simultaneous (but not homogeneous) experience with these phenomena and facts, to the densification of people in global and globalized urban territories, to standardization of lifestyles, but also to the accentuation of cultural diversity (CAVALCANTI, 2010, p. 04).

Thus, the investment is centered on the production of knowledge with greater openness, articulation and integration to the different fields of science. It is also necessary to consider the attempt to overcome technical rationality for a more practical rationality that considers the social phenomena and facts experienced. Thus, "[...] it seeks to understand the complexity inherent to these phenomena and facts, expressed in interdisciplinary knowledge". (MONTEIRO, 2015, p. 04).

Likewise, it is necessary to consider that geographical science is a fertile field when understanding the social aspect of phenomena by choosing geographic space as the object of analysis.

One aspect that has regained importance in recent years is epistemology; In all curricula of undergraduate studies in education, the epistemology of the social sciences and history and geography is included. However, epistemology, as its name implies, refers to knowledge and is an important aspect, but it is not the main function of the teacher: to transmit knowledge, like the priest who communicates communion, but to form this is a broader and more complex task than giving knowledge (VIEIRA, FARIA, 2019).

For the reason given, I believe that pedagogical reflection should explain the role of knowledge in school and the epistemology of geography, insofar as it allows the selection of

the contents and concepts that are the object of examination in school. With the same line of thought, Cavalcanti (2010) points out that:

> Research in the line of Geography teaching in Brazil has been produced with the aim of understanding the dynamics of this process and indicating paths and approaches that produce (or can produce) the best results in the learning and formation of the citizen. Therefore, it is to be expected that the orientations of Didactics and geographical science are present in some way in the teaching practice (CAVALCANTI, 2010, p. 05)

The teaching of Geography implies the existence of a Didactics of Geography; However, at the university level, each geographer progresses in research and knowledge of Geography, but when teaching courses, in general, procedures are not applied to efficiently transmit geographical knowledge to students. Geographers in universities are more researchers than teachers, not considering knowledge, concepts, and teaching methods based on students' abilities (VIEIRA, FARIA, 2019).

On many occasions, it is indicated that the teaching of geography in schools and colleges is routine, theoretical, repetitive of concepts, passive, not very motivating and the responsibility for these deficiencies is attributed to primary school teachers and high school teachers for little teaching the contents of Geography within the program of Studies; However, when these professors passed through the university classrooms, they did not receive the necessary training on how to transmit geographical concepts, what methods to use, what practices to carry out, so that they only master the simple transmission of knowledge in the geographies they approved (GUERRA, 2021).

When the objective is to emphasize the ways in which school and the teaching of geography are inserted in social relations, we think of an education for citizenship. Currently, it is necessary to constantly review the criteria for selecting geographic contents, the construction of new didactic models, the selection of clear and precise concepts used by this discipline, to define the learning objectives, the guidelines used for the sequencing of contents, the curricular development models and the new proposals in the teaching of Geography. Therefore, it is necessary to make a profound change in the teaching and learning processes (VIEIRA, FARIA, 2019).

It is also worth noting that when it comes to teaching the Human Sciences such as Geography, there are many challenges encountered by teachers, due to the constant transformations that the subjects involved in the social environment go through. Gasperazzo (2010) says:

> During the process of analysis and changes in the curricula in the nineteenth century, the change to a more humanistic curriculum was evidenced, with priorities for more literary activities and the formation of intellectuality, other lines sought a

> more scientific, more technical and practical curriculum appropriate to the processes of change that are developed in the country. (GASPERAZZO, 2010, p. 44)

Various criticisms have been raised and put in check the traditional education systems, the pedagogical models that are implemented. It is essential to consider the essence of Geography as a human science in the process of building the human being. To understand this relevance is to allow man to write his history, producing culture by perceiving himself as a subject.

The teaching of these two disciplines that go hand in hand plays an important role in the construction of citizenship and in the social and political emancipation of human beings. For this reason, geographical knowledge takes into account different peoples and cultures in different spaces and temporalities in the simplicity of their manifestations (VIEIRA, FARIA, 2019).

In the teaching of geography (GUERRA, 2021):

1. It is necessary to situate the instruction process in the zone of proximal development, that is, to go beyond spatial knowledge in which the student manifests total autonomy.
2. The spatial representations that the students are building form a welcoming network that conditions the integration of new knowledge.
3. The selection of spatial content as school knowledge and its sequencing throughout teaching must take into account its degree of order of complexity: spatial content from the most perceptive to those of the most abstract nature
4. It is convenient to propose spatial knowledge of situations that have problems for the learner, that have a meaning, a functional value and that provide an active context for learning.
5. Although the reconstruction of knowledge is an individual process, teaching must consider social interaction as a basic instrument to facilitate learning. Intentionality in the teaching of geography is important to determine the learning to be achieved, in this project it is considered that geography is important to the extent that it is an instrument to develop skills and values around space and teach how to think about space to favor the development of a critical social awareness.

The great challenge of teaching Geography is to be able to provide the student with the ability to understand the various interactions between society and nature in the conceptions of territory, place and region, identifying and evaluating the actions of human beings in society and their consequences in its multiple spaces and times. It is necessary to

create conditions so that the student, through his locality and his daily life, is able to develop his ideas in the social environment (DE OLIVEIRA; DA SILVA; GONÇALVES, 2020).

The work with different sources of information is extremely significant in this procedure, because although the specific interdisciplinary node allows the relationship of Economic and Social Geography with other disciplines, there are elements in its study that are necessary from different sources, as it speaks of economic-geographical, biological and/or chemical contents. This allows it to be in better conditions to develop the environmental treatment of the selected content (SILVA; GRYBOVSKI, 2019).

Undoubtedly, cartographic representations allow for greater interpretation in their entirety as an object of study, therefore, the geographical map, in this context, is an essential means of teaching. As well explained in various literatures, in the school context the map is usually presented as a paratext, that is, as an accessory sign around a linguistic text. It is believed that it is necessary to return to the value of the map not only as a paratext, but as a visual text and to highlight the communication processes that can be established in the classroom based on them (DE OLIVEIRA; DA SILVA; GONÇALVES, 2020).

In this sense, the map, as well as other cartographic materials, contains a series of information that is represented by a system of signs, therefore, in the teaching-learning process of geographic contents, the student combines images, such as the words of a sentence, forming a logical series, which is like the grammar of graphic language.

In the case of geographical maps, take into account their classification, whether by the extent of the territory, content or scale; since the content of the cartographic material must correspond to the theme under study. When locating on the geographical map the geographical economic process or phenomenon to which mention is made, it must be specified how it affects the environment where it occurs at the same time, the environmental dynamics will allow how this impact behaves in the geographical space, but over time. This phase seeks to demonstrate that geographic space is not inert, but on the contrary dynamic and that the impact of geographic economic processes does not behave or remains the same over time (DE ARAÚJO, 2021).

The treatment of environmental education in the discipline of Economic and Social Geography is currently a challenge, since scientific and technical advances based on the development of countries do not always imply standards that allow the development of a process that does not harm the environment (SILVA; GRYBOVSKI, 2019).

Therefore, the treatment of environmental education in the teaching-learning process of the discipline Economic and Social Geography should promote an environmentalist

geographical culture, a responsible mode of action with regard to the care and protection of the material resources that are at its disposal, interdisciplinary thinking of environmental education, to understand the importance of its study in the face of environmental problems as a social need.

CONCLUSION

The human sciences play an essential role in education, for this reason, the curriculum has been transformed over time, so that it can be adapted to current realities and needs.

It is essential that lesson plans are not only in textbooks, often decontextualized, and in the still, mostly traditional system that prioritizes reading and repetition, it is therefore necessary to seek an education in which the student can experience the processes of knowledge and bring them to their reality so that they can make a difference, transforming them.

It is fundamental for the country that its citizens understand space, life, value the socio-cultural heritage of their region or locality. That they are able to identify the social relations in their own social group, that they know how to situate themselves in the face of events in the context in which they are inserted.

Thus, teaching Geography is to commit oneself to the formation of the citizen, taking into account Vygotsky's socio-interactionist conception defended by the authors studied. Teachers, with regard to this human science, need to rely on other professionals in the area to guide them, improving their work with the contents that involve the discipline. It is also very important that the departments of education provide better courses and resources so that teachers can do a satisfactory job in this discipline totally in harmony with the environment in which the students are inserted.

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THE TOXICITY OF AMMONIA: A THEORETICAL APPROACH

https://doi.org/10.56238/sevened2024.033-005

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ABSTRACT

Ammonia, a compound of great importance today, is present in agricultural activities and even in the technological industry, such as in the generation of clean energy. This chapter will address a brief analysis of the toxicity of ammonia in the human body through theoretical results using very useful methods of computational chemistry, analyzing the basic and solubility properties of this substance as well as its bioavailability according to the pH change.

Keywords: Ammonia. Toxicity. Bioavailability.

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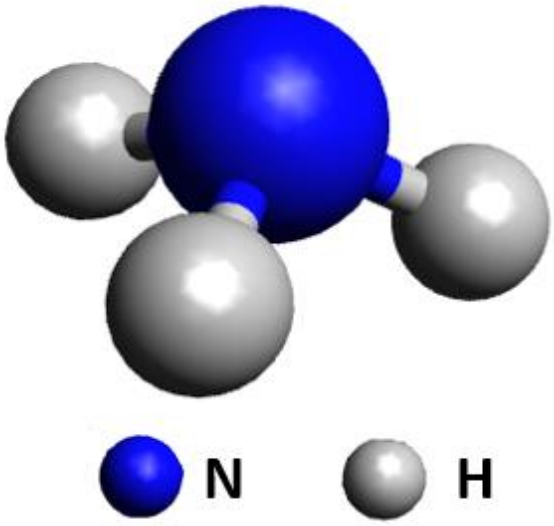
INTRODUCTION

Nitrogen existing in nature can be found in the following forms: gaseous nitrogen (N2), nitrite ion ($NO2^-$), nitrate ion ($NO3^-$), ammonium ion (NH4+) and ammonia (NH3). Ammonia is a gaseous, colorless compound that has a strong unpleasant odor (THANS, 2008).

Ammonia is very present in agriculture as one of the compounds that are excreted after production (SOUSA, *et* al, 2016), as well as in industry as a fuel for the generation of clean energy (YAPICIOGLU; DINCER, 2019).

Three-dimensional structure of ammonia



Source: Antonia Beatriz Cavalcante David Vieira

METHODOLOGY

The three-dimensional structure of ammonia was plotted in the Avogadro program: an open source molecular constructor and visualization tool, in version 1.2.0 (http://avogadro.cc/), indexed to the online server Playground Chemaxon© (https://disco.chemaxon.com/calculators/demo/playground/) for the analysis of microspecies, pKa value and solubility and lipophilicity coefficients.

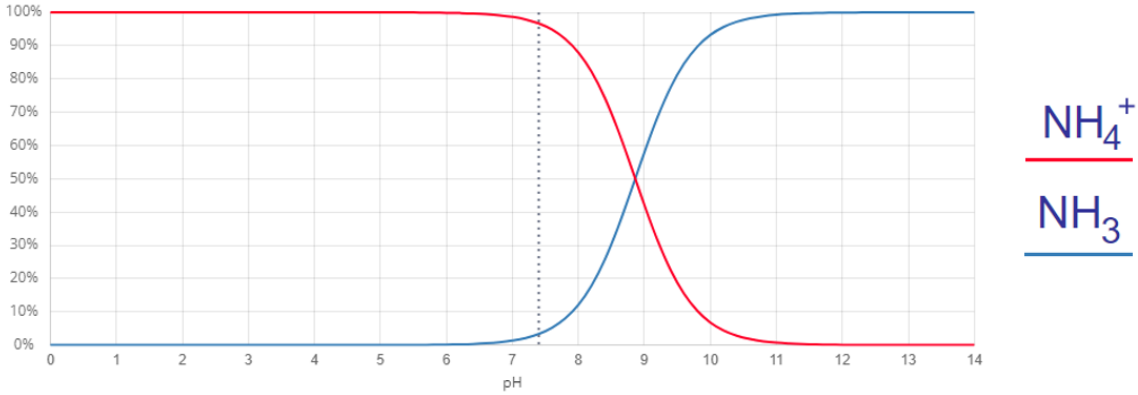
RESULTS

Ammonia has a molecular mass of 17.03 g/mol and a pKa equal to 8.86, that is, it is a basic compound. This substance coexists with its ionized form (NH4+) and its concentrations can vary according to the pH of the medium (BERNARDI, 2022). At physiological pH (pH = 7.40), the ionized species has a concentration equal to 96.70% and the non-ionized species has a concentration equal to 3.30% (Figure 2).

The partition coefficients (logP) and distribution coefficients (logD) are parameters used as a quantitative measure of the lipophilicity of bioactive compounds (WAGER *et al*, 2016), they are important to understand the behavior of substances in the environment in which they are inserted.

Ammonia has the following values: -0.98 for logP and 0.53 for logD, that is, the value of the partition coefficient indicates that the ammonia has good solubility, and the value of the distribution coefficient, in physiological pH, less than 1, indicates that the compound has a low absorption due to its high permeability, and also have a high renal elimination (KAH; BROWN, 2008).

Concentration of ammonia microspecies with the pH variation.



Source: Antonia Beatriz Cavalcante David Vieira

CONCLUSION

Through the analyses presented, it is understood that ammonia is toxic in the human body and the physiological pH can interfere with the bioavailability of the compound due to its unfavorable oral absorption, however, it is worth mentioning that in controlled quantities, ammonia will be dissolved in the body, will not be absorbed and will have a high tendency to be eliminated renally.

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TEACHING AND LEARNING EXPERIENCES IN NURSING DISCIPLINES IN WOMEN'S HEALTH CARE

https://doi.org/10.56238/sevened2024.033-006

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ABSTRACT

Introduction- Women's health care is broad and has required investments and actions from managers and society for the implementation of efficient care. Since the creation of the Unified Health System and the Comprehensive Women's Health Care Policy, in the 80s, several advances have been implemented with the objective of improving and qualifying the promotion of women's health. Objective- To report the experiences of developing activities in the disciplines of Nursing in Women's Health Care I and II, emphasizing the teaching strategies, and reflections on the teaching-learning process. Method- Qualitative study of the experience report type, which describes the experiences of nursing students, in the development of activities of the disciplines of Nursing in Women's Health Care I and II, at the Federal University of Paraíba, of the fifth and sixth period of the Undergraduate Nursing Course, from December 2023 to November 2024. Results and Discussion- The disciplines of Nursing in Women's Health Care I and II used several teaching-learning strategies such as: reception, commented newspaper, realistic simulations, technical visits, organization of events, use of film and creation of podcast, gamification, expanded summaries, supervised practices in health units. The disciplines provided a space for growth and deep reflections on the demands of nursing in women's health, providing quality training. Conclusions- The disciplines contributed with an enriching experience for nursing students, preparing them to face specific challenges of professional practice in women's health care. The combination

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of theory and practice experienced with a playful and dynamic approach proved to be effective for the training of professionals who are more aware, critical and able to deal with the needs of the female population.

Keywords: Nursing. Higher education. Students. Methodology.

INTRODUCTION

Women's health care is broad and has required managers and society to invest and take actions to implement efficient care. Since the creation of the Unified Health System and the Comprehensive Women's Health Care Policy, in the 80s, several advances have been implemented with the aim of improving and qualifying the promotion of women's health in their various needs and life cycles (Sehnem et. al, 2021).

In view of this, it is important to qualify the academic training of health professionals to develop quality and safe care. Knowing, investing and innovating the teaching-learning process in the training of competent nurses trained to provide quality care to women is fundamental. The Pedagogical Project of the Nursing Course should dialogue with the principles of the Unified Health System (SUS) and guidelines of the National Policy for Comprehensive Women's Health Care (PNAISM) to train professionals trained in the implementation of actions that reduce morbidity and mortality and adopt good practices and actions based on scientific evidence (Brasil, 2016; Possamai *et al.*, 2021).

In this context, the Federal University of Paraíba (UFPB) has been committed to the excellent training of nurses, implementing various teaching-learning methodologies that enable the development of skills and competencies.

In order to comply with the syllabus and provide quality, efficient, innovative, creative and critical teaching-learning, in times of advances in educational technologies, teachers have been committed to implementing attractive and stimulating teaching modalities and strategies, considering that students are from another generation, deeply inserted in technological processes and with other needs and characteristics.

Thus, this study aims to report the experiences of developing the activities developed in the disciplines of Nursing in Women's Health Care I and II, emphasizing the teaching strategies and the reflections on the teaching-learning process.

METHODOLOGY

This is a qualitative study of the experience report type, which describes the experiences in the development of activities in the disciplines of Nursing in Women's Health Care I and II, at UFPB, of the fifth and sixth period of the Undergraduate Nursing Course, from December 2023 to November 2024. It aims to report the experiences of developing the activities developed in the disciplines Nursing in Women's Health Care I and II, highlighting the teaching strategies, and the reflections on the teaching-learning process.

STRUCTURE OF THE DISCIPLINES

The disciplines were conducted by three professors and three monitors. The Federal University of Paraíba (UFPB), within the scope of the Department of Collective Health Nursing, offers the disciplines "Nursing in Women's Health Care I", with 30 theoretical hours and 30 practical hours, and "Nursing in Women's Health Care II", with 60 theoretical hours and 60 practical hours, (Pedagogical course project, 2007). Chart 1 presents the characteristics of the disciplines as well as their syllabus.

Table 1. Characteristics of the disciplines and syllabus, João Pessoa, 2024

DISCIPLINE	CREDITS	TOTAL WORKLOAD	SYLLABUS
NURSING IN WOMEN'S HEALTH CARE I	4 credits	30 theoretical 30 practices Total = 60 hours	Study of current public policies for women's health and gender issues in the political, socioeconomic and cultural context, focusing on the systematization of the nursing care process in primary health care
NURSING IN WOMEN'S HEALTH CARE II	08 credits	60 theoretical 60 practices Total=120 hours	Study of current public policies for women's health in the pregnancy-puerperal cycle, focusing on the systematization of the nursing care process at the various levels of health care, particularizing institutionalized care in prenatal care, childbirth and puerperium. It studies the anatomical-pathophysiological and psychological aspects of women during pregnancy, labor, delivery and puerperium, focusing on the foundation and implementation of basic women's health actions during prenatal care, labor, delivery and puerperium and the participation of nursing from the perspective of humanization of the care process

Source: Pedagogical Project of the Nursing Course at UFPB

CHRONOGRAMS

The schedule is divided into modules that address central themes of women's health, with a combination of theoretical meetings, practical activities, evaluations and technical visits. The first meeting aims to welcome students and present the discipline, the syllabus, the methodology and the evaluation criteria, in addition to the formation of groups for theoretical-practical activities.

RESULTS AND DISCUSSION

The disciplines, mentioned above, were divided into modules. Below we will present the pedagogical proposals and strategies used in the various contents worked on in the two curricular components:

RECEPTION

At the beginning of the period, in the first meeting, the reception took place. Coming from the word welcome, it has several meanings such as: to shelter, to shelter, to safeguard, to protect, to support, to support and is understood by the professors as a moment to favor empathy and friendship between students and professors, in addition to contributing to the promotion of health and physical and mental well-being, favoring participation, co-responsibility and motivation to participate and collaborate (Ramos *et. al*, 2021).

At this first moment, the students were respectfully received with a welcome and a welcoming smile from the team of teachers and monitors, in an environment prepared in advance. The classroom is transformed with the ambience provided by the spraying of aromas and the distribution of chairs in a circle, where everyone including teachers is seated, with the possibility of viewing each face, in a space for exchanges and sharing of experiences. On each chair, a sticker post was placed with a message of encouragement through a poem, welcome and a chocolate.

The reception was carried out and divided into stages, inspired by the systematization of Professor Adalberto Barreto (Barreto, 2008):

First stage: Celebration - time to share joys, achievements and victories, as well as special situations or dates, and rejoice in achievements and important moments.

Second stage: Group dynamics - serve to break the ice, relax and create a friendlier, more loving and friendly environment. Conducive to trust and exchanges.

Third stage: Speaking space - Speaking moments were provided with personal presentations, expectations and contributions of each one to the success of the course.

COMMENTED NEWSPAPER

Public Policies in Women's Health Care were addressed, bringing a history of policy development and results achieved. To work on this theme, the strategy of the Commented Newspaper was used, where students are previously instrumentalized with theoretical material such as articles and manuals. In the classroom, they freely prepare a newspaper that will bring the theme in a creative way, as if they were presenting the news (theme) to the community. The use of activities such as the "Commented Journal" allowed a critical analysis of public policies and their repercussions on nursing practice.

REALISTIC SIMULATIONS - LABORATORY OF STUDIES AND PRACTICES IN WOMEN'S HEALTH

The groups of students participated in supervised practices in Realistic Simulations in an organized environment (laboratory of studies and practices in women's health) to simulate real care, in order to develop specific skills in the control of breast and cervical cancer, prenatal, prepartum, childbirth, care for the newborn, puerperium and breastfeeding with a focus on care in consultations, physical examinations and in the interpretation of exams, as well as in the various nursing records. This practical experience was essential to consolidate theoretical knowledge and promote skills. The students performed realistic simulations based on clinical cases related to women's health. Scripts were constructed to guide nursing consultations. This experience allows students to develop skills, leadership, and greater confidence in carrying out procedures and managing care (Sehnem, 2021)

TECHNICAL VISITS

Technical visits were carried out in places of care for women, where the student was able to experience the various managerial approaches, procedures and competencies necessary for the performance. This contact with the specialized care environment contributed to a broader understanding of the challenges faced in women's health (Da Penha and Nazário, 2020).

EVENT ORGANIZATION

The Sexual and Reproductive Health Exhibition was held. Event organized in a Basic Health Unit, with the aim of developing students' skills in organizing events and developing activities with the community. Initially, a previous study of the theme was carried out with the presentation to the teachers of its themes in a conversation circle so that everyone had the opportunity to learn and the teachers contributed with knowledge, integrating theoretical and practical learning. This strategy establishes proximity and exchanges between the university, health services and the community, also favoring the training of service professionals, promoting quality care (Cardoso *et. al.*, 2021).

USE OF FILM AND PODCAST CREATION AS A TEACHING-LEARNING STRATEGY

The use of films and Podcasts combine the emotional, the cultural, and the entertainment to promote teaching and learning. It is a strategy considered pleasurable and that promotes reflection, contextualization, and learning by providing time for discussion

and reflection on important topics in a playful and interactive way (Eckert, Baumgratz, and Hermel, 2022).

In the disciplines, Podcasts were prepared with themes such as Hypertension in pregnancy, Diabetes Mellitus, and the film/documentary City of Joy - where hope lives, which deals with gender and violence against women, was used. The students received a script to fill out and later a conversation circle was held for reflection and considerations. The use of films and Podcasts promote awareness about the health problem, leading to the constitution of a critical and thinking citizen; it allows associating knowledge, previously constituted, with the contents presented on screen, allowing analogies and knowledge formation (Eckert, Baumgratz and Hermel, 2022)

GAMIFICATION

According to Haruna *et al.* (2019), using gamification in health increases involvement, makes the learning environment more interactive, offers practical skills and its repetitive nature favors learning. In the disciplines, didactic materials and games were built for use in the classroom and with the community. Some of the topics addressed were the non-pharmacological strategies for pain relief in labor and the contraceptive method of the Table. According to Pourabbasi *et al.,* (2020), the use of games to work on the theme in teaching brings more benefits to learning than traditional methods, improves social skills, learning retention and creativity in users.

EXPANDED ABSTRACTS - RESEARCH DEVELOPMENT

The disciplines stimulate critical thinking and the preparation of material for publication. All students participated in the elaboration of Expanded Abstracts on the themes: Experience of Sexuality by Elderly Women, Mourning of Elderly Women, Nursing Care for Women in the Climacteric, Violence Against Elderly Women.

SUPERVISED PRACTICES IN HEALTH UNITS

The disciplines allowed students to experience the direct management of women and their newborns and the community in the various hospital contexts and in basic health units. The students provided assistance in the risk classification sector, prepartum, delivery and postpartum, breastfeeding management, immediate and mediate care for the newborn, vaccination room, rooming-in, prenatal care, gynecological assistance to women and oncotic Pap smear collection. The disciplines provided a space for growth and deep

reflections on the demands of nursing in women's health. The process of Systematization of Nursing Care was also used.

Challenges included the need to adapt to the extensive content and its practical application, as well as the constant evaluation of learning in the various learning processes used. The students experienced real experiences of care in real time and at the end they demonstrated satisfaction with the teaching-learning process experienced. According to Justino *et al.* (2024) Supervised internships contribute to quality training, provide important knowledge and provide conditions for the development of skills and abilities.

CONCLUSION

The report of the activities developed in the disciplines Nursing in Women's Health Care I and II highlights the relevance of innovative and integrative methodologies in nursing education. By adopting strategies such as welcoming, commented newspaper, realistic simulations, technical visits, community events, and practical classes in hospital units and basic health units, it was possible to create a dynamic teaching-learning experience centered on the practical reality of women's health care. These strategies allowed students to develop technical skills, in addition to a critical and humanized view, fundamental for professional practice.

Furthermore, the methodological approach also provided a favorable environment for the development of specific competencies in the care of women in different life cycles, in line with the guidelines of the National Policy for Comprehensive Attention to Women's Health and the principles of the Unified Health System.

In addition, activities such as the creation of podcasts, movie reviews, and gamification have proven effective for learning engagement and retention, meeting the needs and interests of the current generation of students.

Thus, it is concluded that the pedagogical strategies applied at UFPB have contributed significantly to the training of nurses able to work with excellence in women's health care. These experiences demonstrated that a solid academic education integrated with care practice is essential to train professionals capable of offering safe, empathetic, humane care based on scientific evidence.

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SMARTPHONES AND SCHOOL PHYSICAL EDUCATION: THE IMPACT OF TACTICAL BOARD APPS ON STUDENT PARTICIPATION AND UNDERSTANDING IN INVASION SPORTS

https://doi.org/10.56238/sevened2024.033-007

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ABSTRACT

This article examines the potential and challenges of integrating *smartphones*, specifically tactical board apps, into PE classes. The study, conducted with 67 9th graders, found that the use of smartphones increased students' interest and made it easier for them to understand tactical systems, especially in invasion sports like handball and basketball. The tactical board app was found to be intuitive, allowing students to focus on the content instead of worrying about the technical aspects of the app. However, the study also found that some students had difficulty translating the knowledge gained through the app into practical situations on the court. This difficulty highlights the need for effective pedagogical strategies that help students bridge the gap between virtual learning and practical application, demonstrating that the integration of smartphones in Physical Education requires a thoughtful and reflective approach that explores the potential benefits, but also recognizes the challenges and responsibilities associated with *smartphone* use in schools. It is concluded that there is a need for further studies to ensure that the skills developed digitally are effectively transferred to practice, to optimize the teaching-learning process.

Keywords: Smartphone. School Physical Education. Tactical Board. Invasion Sport.

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INTRODUCTION

The growing presence of *smartphones* in schools in recent years, as evidenced by IBGE data (2021), demonstrates that most students aged 10 and over access the Internet predominantly through these devices. In Brazil, public policies, such as the Civil Rights Framework for the Internet (Law 12,965/14) and the recent National Policy on Digital Education (Law 14,533/23), have reinforced digital inclusion in schools, creating an educational environment in constant transformation.

In this context, *smartphones* emerge as pedagogical tools that offer varied functionalities, such as performance analysis and production of educational content. Such devices can be integrated into teaching in an innovative way, which allow for more visual and dynamic learning, complementing practical activities and making learning more meaningful and engaging. This context presents specific challenges for Physical Education, traditionally based on body movement, which is also part of this new panorama. Thus, it is likely that there will be difficulties in integrating technologies into the pedagogical practices of Physical Education (Tahara and Darido, 2016).

Traditionally, Physical Education classes are based on conventional sports practices, games and outdoor activities. The contemporary educational scenario requires constant adaptation in order to incorporate modern technologies into the teaching and learning process, making it necessary for teachers to take responsibility for the use of technology in a critical and proactive manner (Falsetti; Delbin; Martelli, 2021).

The theoretical framework of this study explores the insertion of Digital Information and Communication Technologies (DICT) in School Physical Education, with emphasis on the use of the *smartphone* as a pedagogical resource. The integration of DICT into the school environment has provided new possibilities for student interaction and engagement, but it also faces challenges, such as the lack of adequate infrastructure and the need for continuous teacher training (Gemente, Silva & Matthiesen, 2021). Teacher training is essential for pedagogical practices to adapt to the use of these technologies, allowing teachers to develop technical and pedagogical skills to critically and reflexively integrate *smartphones* and other DICT into the teaching-learning process (Falsetti, Delbin & Martelli, 2021).

The use of *smartphones* in Physical Education classes can reconfigure pedagogical methodologies, promoting learning aligned with the technological demands of students. In this sense, the use of applications (in the case of this study, the tactical board applications) stands out, allowing a dynamic visual support for the teaching of sports, especially in invasion sports. Studies indicate that pedagogical resources, used from *smartphones*, can

increase the interest, engagement, and participation of students in classes, transforming physical activities into more interactive experiences (Oliveira, 2020).

However, the effective adoption of these technologies requires a coherent articulation between pedagogical and technological demands, as well as an effort in teacher training to ensure the full and effective use of smartphones in teaching. This study investigates, through a survey of 9th grade students, the opportunities and challenges of using *smartphones* in Physical Education classes, particularly with a focus on understanding tactical systems through a tactical board app. The research is justified by the difficulty that many students have in understanding these systems from traditional materials, such as notebooks and textbooks, highlighting the potential of the smartphone to make learning more accessible and engaging.

Thus, the relevance of the use of DICT, especially *smartphones*, in the context of School Physical Education, reflects the need for a pedagogical approach adapted to the reality of students, promoting a more dynamic teaching environment and aligned with the new demands of the contemporary educational context.

METHODOLOGY

The quantitative-qualitative research (Bogdan, 1994) was carried out with 67 students from the 9th grade of Elementary School in a public school. Of these, 10 students (5 boys and 5 girls) participated in the focus group. The selection of participants considered criteria such as participation in the didactic sequence, with the objective of capturing students' opinions and experiences about the use of *smartphones* in Physical Education classes, in the final years of Elementary School. The investigation was structured around a didactic sequence composed of six classes that used *smartphones* as a pedagogical resource for the teaching of invasion sports. After these classes, a focus group was organized to understand their perceptions (Gatti, 2005).

The focus group participants were selected considering those who completed the didactic sequence and had previously volunteered. Data collection included 2 focus group sessions. 10 students participated, with equal distribution between genders, and the discussions were transcribed and analyzed using the content analysis technique (Bardin, 2011) and quantitatively using the IRAMUTEQ software, which helped to map the most frequent words and emerging themes from the students' discussions.

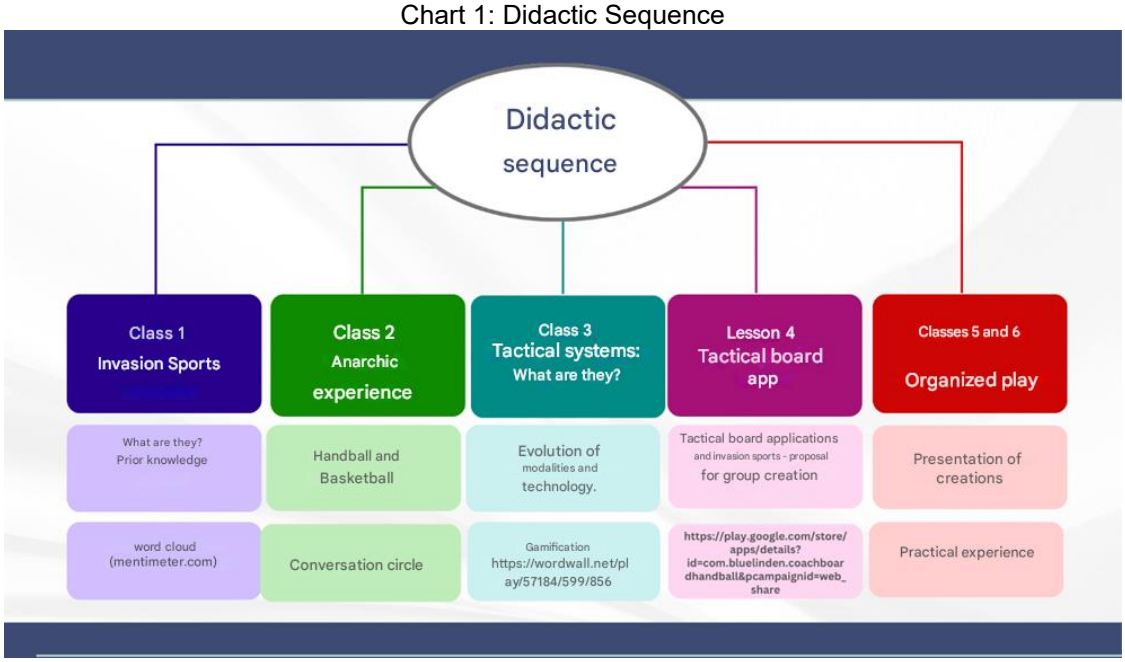
The procedures to ensure research ethics strictly followed the guidelines of the National Council for Ethics and Research (CONEP), with prior approval by the University's Ethics Committee under number 6.764.905/24. The research also respected ethical

precepts, such as the Informed Consent Form (ICF) and the Informed Consent Form (TALE), ensuring the confidentiality and voluntariness of the participants.

DIDACTIC SEQUENCE

Lasting six classes, the didactic sequence addressed the theme of invasion sports (Handball and Basketball), using a tactical board application as a pedagogical tool, having as reference the National Common Curricular Base (Brazil, 2018) and the São Paulo Curriculum (São Paulo, 2019). The method chosen was that of teaching from the tactical approach in invasion sports (Dumke; Ginciene; Borges, 2021).

Chart 1: Didactic Sequence



Source: Prepared by the authors

FOCUS GROUP

Two focus group meetings were held, lasting one hour each, with the aim of deepening the understanding of the influence of the use of smartphones on student participation and understanding. The meetings addressed the following questions:

Meeting 1: How was the use of the tactical board application to understand tactical systems in invasion sports during Physical Education classes?

Meeting 2: How did the use of the smartphone affect your participation in Physical Education classes?

The discussions were recorded and transcribed for later content analysis, using the IRAMUTEQ software for lexical frequency and word cloud analysis, and following the steps proposed by Bardin (2011) for data interpretation.

RESULTS AND DISCUSSION

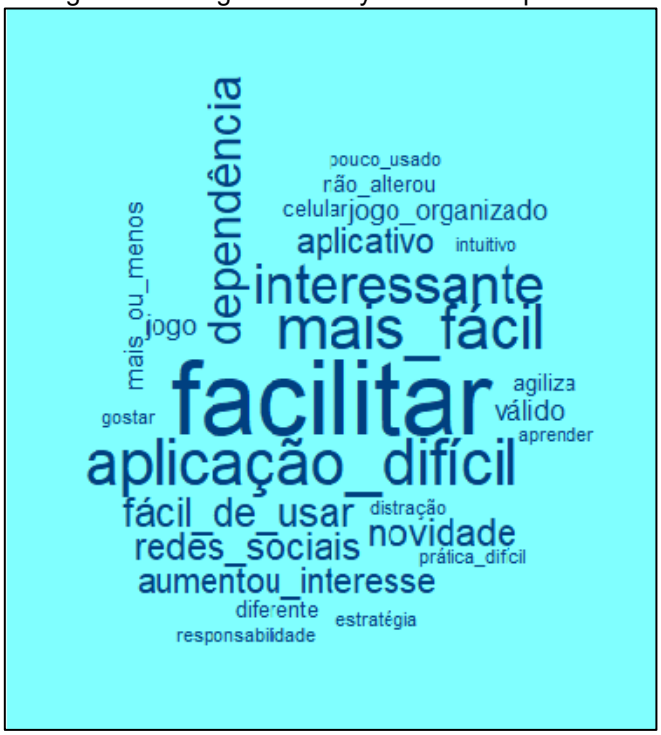
The results of the focus group meetings brought important reflections on the use of the tactical board application on smartphones in Physical Education classes. During these sessions, positive perceptions and practical challenges related to the use of this technology in the pedagogical context emerged.

Table 1: Lexical frequency analysis

Theme	Number of Occurrences
Facilitate	31
Difficult application	18
Easier	17
Interesting	15
Dependency	12

Source: Prepared by the authors

Image 1: Words generated by the Iramuteq software



Source: Prepared by the authors

The analysis of the data collected in the focus group revealed three main themes: increased interest, ease of handling the application and difficulty in practical application.

INCREASE IN INTEREST

The use of the tactical board application showed a greater interest of students in Physical Education classes. The tool made learning more attractive and dynamic, bringing it closer to the students' digital reality, as evidenced in the reports:

> "The app. It seems that I was more interested. I was able to see things that I didn't see" (Student 1).
> "It has changed. Because I was interested" (Student 3).
> "People are more interested. It's a business that we're about to start. It's an easy thing to do. The person already has a habit. It's easy. The person will make it" (Student 6).

Students' familiarity with *smartphones* and the possibility of interacting with the content digitally contributed to this greater interest, corroborating the observations of Seibel and Isse (2017), and Gemente, Silva and Matthiesen (2021) on the potential of *smartphones* to increase student participation and engagement in Physical Education classes.

EASE OF HANDLING THE APPLICATION

The app was found to be intuitive and easy to use by most participants. Despite some initial difficulties, the user-friendly interface allowed students to focus on the content rather than the technical aspects, as reported by some students:

> "Easy. Easy? He is very intuitive" (Student 6).
> "At first, I thought it was complicated. But once you get the hang of it, it gets easier" (Student 7).

This ease of use corroborates Oliveira's (2020) observation about the ability of young people to handle smartphones. In addition, the ease of use of the app allowed students to explore different possibilities for tactical creation, which contributed to more autonomous and creative learning, as noted by Tahara and Darido (2016).

DIFFICULTY IN PRACTICAL APPLICATION

Although the app has made it easier to understand tactical systems, some students have faced difficulties in applying the knowledge acquired in practical activities on the court. This difficulty may be related to the complexity of the transition from the virtual to the real

environment, as pointed out by Bacich and Moran (2017), who discuss the challenges of integration between the traditional and digital teaching models.

Some reports from the students illustrate this difficulty:

> "We went there to see if it worked. Then, in practice, it got very complicated, you know?" (Student 3);
> "It was difficult and not easy. It was something that if I could visualize it very quickly, I could get there on the court, put it there and stuff, without... Without needing the application" (Student 8).
> "It was harder, right? I think it was more difficult too, to have people who don't help much, right? yes, they were playing there. That's right?" (Student 6).

These reports suggest that practical experience requires additional skills, such as communication, collaboration, and adaptation to unforeseen situations, which may not be fully developed in the virtual environment of the application. The difficulty in practical application highlights the importance of pedagogical strategies that help students to bridge this gap between the virtual and the real, such as creating bridges between the application and practice on the court, through activities that simulate game situations, and stimulating teamwork and communication among students. so that they can apply the knowledge acquired in the application collaboratively.

The research showed, then, that the use of *smartphones* and tactical board applications can be an effective strategy to increase interest and facilitate students' understanding in Physical Education classes. The positive results observed in terms of increased interest and ease of handling of the application corroborate the literature that defends the pedagogical potential of smartphones in EFE.

However, it is critical to recognize the challenges in the practical application of knowledge, such as the need for more time for practice, proper pedagogical mediation, and the development of interpersonal skills. The difficulty in transitioning from the virtual to the real environment highlights the importance of pedagogical strategies that help students in this process. It is necessary to go beyond the simple dichotomy between banning and releasing smartphones in schools, seeking a path that allows exploring the pedagogical potential of these devices, without ignoring the challenges and responsibilities that their use implies.

FINAL CONSIDERATIONS

The integration of *smartphones* in Physical Education classes requires a critical and reflective approach, which considers the needs and perceptions of students. It is important that the use of technology is planned in a way that complements, and not replaces, practical activities, promoting meaningful and contextualized learning.

"Liquid modernity", as defined by Bauman (2001), imposes a constant challenge to education. Technologies, social relations and knowledge itself are in constant flux and transformation, demanding a flexible and critical posture on the part of educators and students. In this context, continuing education for teachers emerges as a crucial element, in order to enable them to use DICT in their pedagogical practices, exploring the potential of smartphones and other digital tools to promote meaningful and engaging learning.

In summary, the research points to a promising future regarding the integration of smartphones in PE, but emphasizes the need for caution, planning and adequate training so that this integration translates into meaningful learning for students. Further research is needed to deepen the understanding of the challenges and potentialities of the use of smartphones in EFE, contributing to the construction of innovative and effective pedagogical practices that accompany the transformations of contemporary society.

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TRANSFORMATIONS IN EDUCATION: TECHNOLOGICAL INNOVATIONS AND PEDAGOGICAL PRACTICES FOR INCLUSIVE AND PERSONALIZED TEACHING

https://doi.org/10.56238/sevened2024.033-008

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ABSTRACT

This work addresses the transformations in education driven by new technologies and pedagogical practices, to make teaching more inclusive, personalized and dynamic. The integration of Information and Communication Technologies (ICTs) has reconfigured the teaching-learning process, promoting interactive, collaborative and student-centered methods. The use of technologies such as artificial intelligence, augmented reality, and gamification makes it easier to adapt teaching to the individual needs of students, taking into account their learning pace and interests. Contemporary education also benefits from practices that connect theory and practice, contextualizing content to make it more relevant. However, the process of adopting new methodologies faces challenges, such as resistance from educators and inequality in access to technologies. Teacher training to integrate ICTs with pedagogical knowledge is essential to ensure the success of innovations. In addition, it

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is necessary to create interactive and collaborative learning environments that allow students to become protagonists of their learning. The text also highlights the importance of considering the sociocultural context of the students, evidencing the interaction between formal education and the family environment in the educational process.

Keywords: Inclusive education. Digital education. Digital technology.

INTRODUCTION

The field of education is always in the midst of a process of major transformations, in which it seeks to increase the integration between emerging technologies and new pedagogical approaches, which challenges conventional educational methodologies. Advances in technology, together with the emergence of new theories and pedagogical practices, have reconfigured the way we understand the teaching-learning process. In this scenario, the Educational Sciences are restructuring themselves to keep up with the rapid changes, with the aim of making it more inclusive, personalized and dynamic (Dede, 2009).

Innovations related to education seek to adapt teaching to the specific needs of each student, which takes into account individuality, such as the specific difficulties of each one, the pace of learning and the interests of the student. In addition, these innovations are focused on the continuous evolution of teaching methods, in the search for more interactive, collaborative, and student-centered activities. The use of technologies such as artificial intelligence, augmented reality, gamification, and adaptive learning tools has been essential to offer innovative solutions that enhance the educational experience (Siemens, 2005).

For Jonassen (1999), learning becomes more effective when students can see the practical application of what they are studying, which involves contextualizing the content, and can be obtained through specific scenarios and real cases, becoming more relevant and attractive to students. These adaptations emphasize the importance of recognizing that each student brings with them a unique set of experiences and needs that must be taken into account for a truly inclusive and effective education.

Overall, the transition from standardized models to customized approaches reflects a deeper understanding of students' needs and the demands of the labor market. Institutions that incorporate these practices tend to provide more effective and engaging learning experiences, and ensure that education serves an increasingly diverse and demanding audience.

Information and Communication Technologies (ICTs) are the main responsible for changes in social relations and in the educational field, whether in face-to-face or distance learning. They allow changes, both directly and indirectly, in the ways of teaching and learning, which continuously need to be reconfigured in order to seek to serve different generations of students in the most diverse environments.

The combination of traditional pedagogical practices with digital technologies, without adequate planning, can result in an experience that does not meet the expectations of modern training and professional development. An important point is to invest in the training

of educators and create learning environments that encourage interactivity, collaboration and personalization of teaching, and that allow students to become protagonists of their own learning. In addition, educators can guide students in the characterization, reconstruction and materialization of their knowledge through new languages (Silva *et al*., 2024).

The training of teachers in the use of ICTs is important, but it is necessary to have an integration with pedagogical and didactic knowledge, which allows discussions, debates and questions about their use, as well as in the teaching-learning process as a whole, and thus enrich the educational whole. By making this transition, the teaching-learning process can not only overcome the limitations of traditional approaches, but also prepare students for challenges in the labor market, which increasingly requires differentiated competencies and self-learning skills.

There is also a significant influence of the family environment in the educational process. Students from family backgrounds who support educational innovations and cultivate a culturally enriching environment tend to show faster academic progress. This finding emphasizes the interrelationship between formal education and the student's sociocultural context, and indicates that learning is also impacted by several external factors. This strategy reinforces the modern conception that education is a multifaceted process, which involves the interaction between students, teachers and the socio-family context.

In this context, the present work aims to explore and detail some of the main innovative approaches that are shaping contemporary education. It sought to discuss how these new approaches and technologies are being applied in classrooms and what is their impact on student development, educator training and educational management, through an analysis supported by scientific and academic references. The discussions are based on contemporary pedagogical theories and case studies that exemplify the effectiveness of these innovations in the current education scenario.

INFORMATION AND COMMUNICATION TECHNOLOGIES

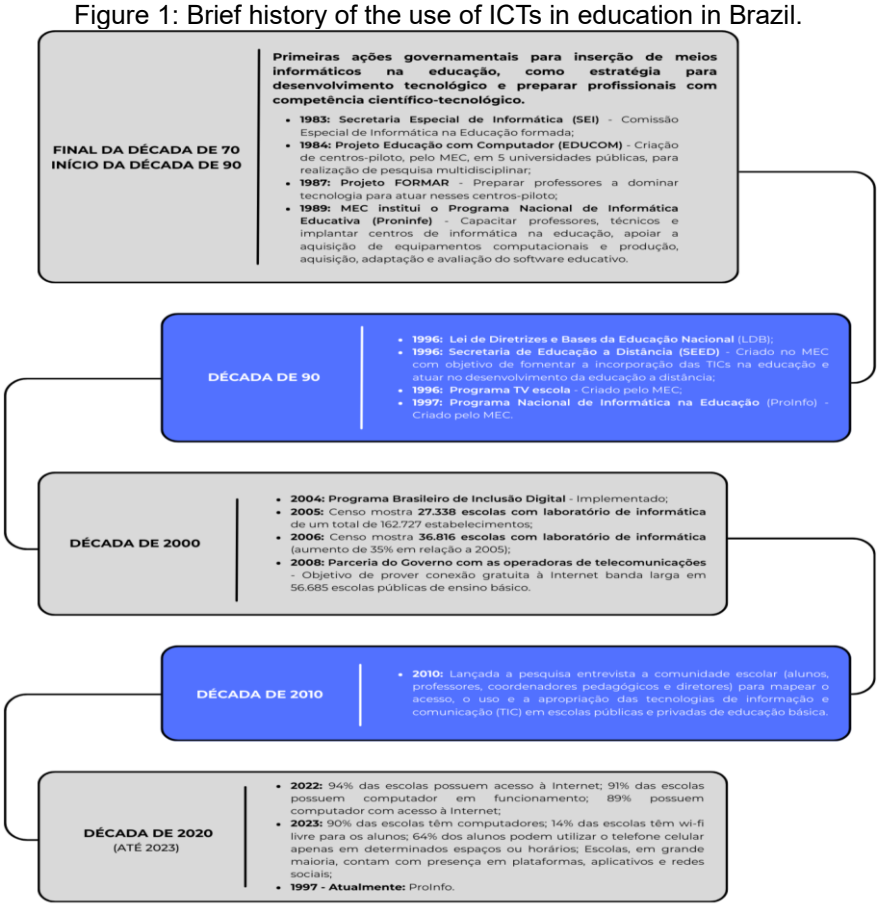
The internet represents one of the most significant milestones in the cultural transformations driven by technological evolution. According to Castells (2002), the internet has been consolidated as the means of communication with the greatest insertion in society. While radio took thirty years to reach sixty million people, TV reached this level of diffusion in 15 years, and the internet reached this level in just three years. Despite its global diffusion, it is important to highlight that, in the year 2000, about 88% of internet

users were located in industrialized countries, which represented only 15% of the world's population (Castells, 2002).

While the internet is often perceived as a global technology and independent of geographic location, disparity in access remains a significant challenge (Lima and Araujo, 2021). In this context, discussions about the future of education must take into account the transformations in the relationship with knowledge (Guilherme *et al.*, 2024). Innovative technologies facilitate the expansion, expression and modification of students' cognitive functions, such as memory, imagination, perception and reasoning, through new forms of access to information (Castells, 2002).

Several decrees and guidelines have been drafted to regulate and promote Education in Brazil, such as the Law of Guidelines and Bases of National Education (LDB). More recently, Decree No. 9,057/2017 emphasizes the role of Information and Communication Technologies, highlighting that didactic-pedagogical mediation can occur with the use of ICTs, involving teachers and students in the development of educational activities in different places or times (Brasil, 2017). This decree also emphasizes the importance of ICTs in promoting learning and creating more dynamic and interactive educational environments.

Figure 1: Brief history of the use of ICTs in education in Brazil.



Source: Adapted from Almeida, 2008; Rosa, 2017; Cetic.br, 2023; Cetic.br, 2024.

ICTs provide opportunities for teachers to instruct students and create conditions for them to express their thoughts, so that they can reconstruct knowledge in other ways. In this scenario, students are encouraged to transform information into practical knowledge applicable in everyday life (Vieira, 2011). The interest in exploring this theme arises from the need to understand the relevance of the integration of Information and Communication Technologies in the teaching-learning process. ICTs make classes more attractive, allowing students to have the opportunity to build knowledge in an autonomous and meaningful way (Silva *et al.*, 2024).

Jonassen (1999) highlights that learning is more effective when students have the opportunity to see the practical application of what they are studying, involving the contextualization of the content, which can be obtained through specific scenarios and real cases, becoming more relevant to students. These adaptations emphasize the importance of recognizing that each student brings with them a unique set of experiences and needs that must be taken into account for a truly inclusive and effective education.

Countries from all continents make massive investments in the use of ICTs, in pedagogical processes, infrastructure and digital development. Compared to these countries, actions in this area in Brazil started late. Only in the last decade have public policies aimed at digital inclusion in the Brazilian population been instituted in the three governmental spheres (Soares-Leite and Nascimento-Ribeiro, 2012). Thus, only recently has public management observed the real value of ICTs as an instrument for building the future. From then on, public policies were adopted with the objective of boosting development based on new technologies (Pereira and Silva, 2020).

The use of ICT allows for the qualification of learning, through multimedia resources, simulation and synchronous and asynchronous communication tools, in addition to allowing students to develop skills for the use of technologies, which greatly contributes to their professional training (Kampff, 2012). This knowledge became important elements of the National Common Curricular Base. This is a guideline for basic education in Brazil, where at least three of the ten general competencies that the education system should provide to students deal specifically with the technological-digital component (Brasil, 2017).

With the significant technological advancement in recent years, it is possible to create a digital environment composed of virtual tools, providing a wider range of information and resources to the student, making the teaching process more dynamic, effective and innovative. New technologies become highly relevant instruments, acting mainly in the optimization of the teaching-learning process. In addition, the correct use of these tools responsibly and creatively brings numerous benefits to teachers. Technological

devices are very present in the daily lives of the new generation, so the school cannot ignore these influences (Oliveira and Costa, 2023).

Since ICTs are present everywhere, depriving students of this access is the same as limiting their training and performance in the world. In this sense, the real challenge is not to know and know how to handle technological resources, but to recreate a methodology that does not use these resources as a simple transfer from the traditional to the digital. It is essential to make effective use of the various tools currently available to build learning so that the student has interaction and knows how to receive and share knowledge autonomously (Azevedo *et al.*, 2014).

The internet and other devices used in teaching should be used, together, with the objective of making transformations in the traditional pedagogical approach, and not to be an assertive means of communication, only. The use of computerized machines in the educational space must have the function of overcoming conventional barriers, allowing this environment to renew contents, objectives and, especially, methodologies. There are still pessimistic views on the use of ICTs in the classroom. These issues primarily concern the student's behavior in relation to the misuse of technology within the classroom environment. Still, on the other hand, there are views that support the careful and accompanied use of these tools. The proper or improper way of using all technologies depends on the user. Technologies in general give human beings great possibilities of access to information, which can later be transformed into knowledge (Pocinho and Gaspar, 2012).

Furthermore, the use of ICTs in the context of the teaching-learning process is not limited to knowledge of computer techniques. It is necessary that the use of these technologies is associated with the creation of favorable conditions for the appropriation of skills and concepts, by educators and students, so that it is related to a pedagogical content and sociocultural context. Therefore, it is necessary to use new technologies to promote transformations in pedagogical practices, leading to changes in the conception of knowledge and learning, as well as in the roles played by teachers and students in the teaching and learning process (Siqueira, 2013).

It is important to highlight that with the resources of the internet, different digital devices and other educational software, teachers have a wide range of tools and possibilities that were previously non-existent or scarce. A new way of teaching emerges, providing teachers with new ways of constructing knowledge, breaking old paradigms and providing students with better conditions for development. In this scenario, there is a new learning model, also centered on the student, giving him an active and autonomous role in learning (Locatelli, Zoch and Trentin, 2015).

Despite the use of technologies in the classroom and the emergence of advanced and refined methodologies, the student still remains the main individual in the process of knowledge construction. The teacher continues to be the transmitter of information, interacting through questions, leading the student to become an investigator who seeks considerable solutions. The differential, in this case, is the use of technological resources in a creative, careful and pedagogical way, linked to methodologies appropriate to the student's reality. In the classroom, teachers must be able to extract the most from the tools available for the exercise of the function. In view of this, ICTs can be used in different ways. Teachers can make use of documentaries, films, newspaper articles, magazines, website research, field research, visits to virtual and real laboratories, use software for educational content and develop a methodology that attracts the attention of students in an innovative way (Dourado *et al*., 2014).

PERSONALIZED EDUCATION AND ADAPTIVE LEARNING

In the twenty-first century, we observe the advances offered in favor of learning in the educational sphere, which are used as pedagogical strategies aimed at students and their specific needs. Technology as a tool has been widely internalized in the daily lives and work environments of citizens, gaining notoriety within schools and universities, where teachers and students benefit from the range of diversity of technological pedagogical methods. Over the years, the possibility of a more interactive education has demonstrated advances in the learning and inclusion of students, therefore, scientific and technological progress that does not fundamentally respond to human interests, to the needs of our existence, lose its meaning (Freire, 1996).

The term Adaptive Learning (AA) institutes an educational approach that seeks to favor individuals and their particularities, where the personalization of the student's needs is provided through the use of technological methods, thus contributing to the advancement of the student's development (Lamattina and Peralta, 2024). Education has flaws by comprehensively treating all students in the same parameter, the Adaptive Learning system would make it possible to monitor student performance and adjust the gaps that have their flaws, in this way having a report of each individual would bring effectiveness in the inclusion and observance of the particularity of each one. Adaptive learning is not just a technological innovation; it is based on solid scientific principles that combine the science of learning, cognitive psychology, and information technology (Lamattina and Peralta, 2024).

As an example of a digital platform in the field of Adaptive Learning, Knewton uses predictive analytics and AI evaluating student performance to provide a personalized form

of learning, providing the individual with effective methods according to their needs. Another example is the Moodle platform that incorporates basic tools for adapting learning, for example, the "activity locking" feature allows the author/tutor of a course to inhibit, or present certain resources and activities, thus adapting the course structure to its target audience (Bechara and Haguenauer, 2010).

However, such resources do not allow the registration of an inventory of styles and the automatic adaptation of the contents to the style of each learner. To implement adaptive learning, it is critical, regardless of the individual characterization model chosen, to start with an assessment that identifies the student's learning style. The Adaptive Mathematics Platform (PAM) is a tool that uses different educational processes for teaching mathematics and can be used by teachers and students. It works through a set of links that present a series of theoretically based activities, presenting tips and examples of mathematical problem solving.

The range of functional tasks solved with the help of the adaptive platform implemented in systems is extremely wide, from the organization of students' independent work and distance learning to the development of professional skills in the conditions of the modern trend in mathematics (Santos, 2022).

Personalization or personalized education in its deepest sense is not found in a new, more effective form or method of teaching, but in the transformation of learning into a more meaningful element of personal formation through the adaptation and choice of responsibilities by the student himself (Hoz, 2018).

The first mention of personalization was made in mid-1905, by Helen Parkhurst, who created the Dalton plan, in which, when she had to teach classes to several classes at the same time, she had to divide the classes into small groups and each group was dedicated to studying specific subjects. Thus, students could study at their own pace, always working in cooperation with colleagues (Oliveira and Leite, 2021).

Personalized education is evident in active methodologies, which aim to enrich and strengthen the teaching and learning process. In current terms, personalized education presupposes that the student must start from his own choices to learn, according to his interests, curiosities and criteria, selecting the resources he deems most advantageous according to his learning profile (Lima Júnior e Silva, 2021). The insertion of digital technologies in education, especially in hybrid teaching, has enabled their use in the classroom, allowing the customization (personalization) of various sectors to contribute to the teaching and learning process (Oliveira and Leite, 2021).

One of the great advantages of artificial intelligence in education is its ability to adapt educational content to each student. Based on the data collected, algorithms can suggest resources, activities, and teaching strategies that best meet the needs and individual learning pace of each student. Given the great diversity of behaviors that exist in a classroom, since each student has their own particularities, different skills and knowledge, in addition to experiencing different realities, it is important to establish personalized teaching, which focuses on each student, meeting their expectations and needs (Souza, 2023). It is in this context that AI stands out, as an innovative tool capable of providing improvements in the quality of education offered in the vast majority of school organizations.

Intelligent tutor systems or adaptive systems (ITS) emerged in the late 1970s, but only became popular in the 1990s, they are software that offers instructions and feedback to the student, while simultaneously organizing their knowledge bases, from the registration and analysis of user interactions with the system, adapting and managing the teaching and learning process in a dynamic way (De Lima, Silva and Da Silva, 2023). Three main components are considered in the traditional architecture of an ITS. The learner model, domain base, or domain model, and the tutor model. These components correspond to vital functions in the operationalization of the system. Therefore, they do not operate in isolation, but interact with each other, seeking to adapt the computerized environment to the user's needs.

Geekie is an adaptive learning platform that offers personalized teaching and large-scale learning, personalization is carried out through games to help students prepare for the ENEM (National High School Exam), allowing the student to improve their proficiency (Teixeira *et al.*, 2021). Through the algorithms present in the platform, it can identify the main difficulties of students in each subject, providing a better view of each student's development for the teacher, so that it can assist in pointing out and aligning the main problems encountered in learning.

Providing a personalized education aims at the future of students, ensuring that there is importance in all particularities. Data from the School Census in Brazil released by MEC in 2023 report that high school has the highest school dropout rate, contributing with 3.9% and 5.9% (Agência Brasil, 2024). When students are not interested in staying in school, they drop out and, when they do, they are sometimes limited to the logic of reproduction of traditional teaching models.

Consequently, they do not develop the skills and abilities necessary for the complexity of human, social and economic relations in contemporary times. In this scenario,

the concept of personalized education can contribute to the reconfiguration of teaching and learning (Lima Júnior and Silva, 2021). Assigning technology to the mercy of students in an adaptive way would be a great step towards beneficial changes in the school and university environment, aiming at the development and learning of students.

GAMIFICATION AND ACTIVE LEARNING

According to Fernandes *et al.* (2024), the changes that are taking place in education, especially the insertion of new technologies, contribute significantly to improving active learning, and place the student at the center of the learning process, based on the assumption that knowledge is not passively transmitted. In this case, the teacher acts as a mediator, assuming the role of advisor and facilitator. In addition, social interaction is critical for cognitive development.

According to Fernandes *et al*. (2024), we can mention some new technologies used in the active methodology: hybrid teaching, distance learning, problem-based learning, and gamification:

Hybrid Teaching: Pedagogical model that mixes face-to-face teaching and distance learning, providing students with a richer and more personalized learning experience. This approach allows students to interact with teachers and classmates both in the classroom and on online platforms, facilitating the exchange of knowledge and the development of skills (Fernandes *et al.,* 2024). To be successful, students and teachers need to be familiar with technologies and be able to produce, manipulate and interact with content within the virtual environment, because within the context of hybrid teaching this is fundamental (Castro *et al*., 2015).

Distance Education (DE): Teaching modality that uses digital technologies to connect students and teachers, regardless of their geographic locations. Distance education offers flexibility and autonomy to students, allowing them to organize their study schedules and access content on different devices (Fernandes *et al.,* 2024).

Problem-Based Learning (PBL): Problem-based learning consists of problem solving, values the content to be learned and especially the way learning occurs, placing the student as the protagonist in the educational process (Borges *et al*., 2014).

Gamification: Gamification consists of the use of elements and characteristics typical of games in order to contribute to the resolution of certain problems (Santos and Freitas, 2017). Gamification applies elements such as competition, scoring, and instant feedback, to engage students in learning activities. This approach is based on principles of

behavioral psychology and the intrinsic and extrinsic motivation of students, in order to increase participation and engagement.

The fun generated by gamified activities promotes greater ease of learning, in addition to contributing to the formation and improvement of the individual and collective skills of the individuals involved (Alves, 2015; Carvalho, 2016). In this sense, gamification can be understood as a learning strategy that benefits from sociocultural transformations and technological advancement (Caillois, 2017), has the potential to revolutionize several fields, including management. By integrating elements of games, toys, and playfulness (Brougère, 1998), gamification offers a range of possibilities that go beyond mere fun, also encompassing fantasy, imagination, and leisure (Fortuna, 2017).

By applying the logic of games in the construction of models, processes, and systems, there is the construction of a more humanized and people-centered approach. This approach, by considering the user's motivation, feelings, and active participation in building systems, promotes the creation of a collaborative and stimulating environment. According to Alves (2015), the engagement of different audiences with different age groups in different and gamified activities is directly linked to the relevance of the content and the way learning is motivated.

Ramos *et al.* (2024) highlights that, in the face of sociocultural transformations and technological advances, education needs to adapt to meet the demands of new generations. In addition, by offering a personalized and adaptive learning environment, gamification becomes a fundamental tool to engage students and promote the development of essential skills for the twenty-first century. In addition, by combining game elements with curricular content, gamification allows each student to learn at their own pace and according to their preferences, making the educational process more meaningful and effective.

The planning in the choice of educational strategies and technologies and their impacts on the stimulation of cognitive development must be constantly updated and rethought, always taking into account the different realities of the students (Signori and Guimarães, 2016), as can be seen in Chart 1.

Chart 1: Elements of Gamification and examples of how they can be used in teaching and learning.

Element of Gamification	Examples in Education	Objective
Points and Levels	On online learning platforms, students are motivated to complete tasks and challenges to earn points and level up. Each level unlocks new content and features, reflecting the user's progress and the difficulty of the activities (Zichermann and Cunningham, 2011).	Encourage continuous growth and active participation in activities, encouraging student progression and engagement.
Badges e Troféus	Virtual badges, trophies, and medals recognize students' achievements, offering a sense of accomplishment and motivating them to achieve new goals (Zichermann and Cunningham, 2011; Werbach and Hunter, 2012).	Increase students' self-esteem and sense of accomplishment by strengthening confidence in themselves and celebrating their achievements.
Challenges and Missions	The elements guide the user through the platform, defining the tasks and leading them to learning (Zichermann and Cunningham, 2011; Fadel *et al*., 2014), developing skills such as problem-solving and practical application of knowledge.	Stimulate critical thinking and problem-solving, developing analysis and decision-making skills.
Competitions and Rankings	It works as a social ranking, allowing users to compare their progress with that of others and encouraging active participation in the environment. (Klock *et al.*, 2014).	Promote collaboration, healthy competition, and team spirit, as well as develop communication and leadership skills.
Virtual and Real Rewards	Virtual currencies, exchangeable for prizes, and certificates (digital or physical) recognize users' achievements. Extra and voluntary activities award bonus points, speeding up the achievement of rewards (Klock *et al*., 2014).	Reinforce positive behaviors and increase motivation by encouraging study habits and the desire to learn.
Custom Avatars	The creation of personalized avatars, inspired by games (Klock *et al*., 2014), makes the learning experience more personalized and engaging.	Increase the sense of belonging and motivation, stimulating the desire to participate and contribute.
Narratives and Stories	Use of storytelling elements to create engaging stories that contextualize learning, making content more attractive and memorable (Kapp, 2012).	Facilitate memorization and understanding of content, making learning more effective and lasting.
Virtual and Augmented Reality	Immersive simulations that allow students to explore virtual environments and perform experiments. Apps that overlay digital information on the real world.	Offer more interactive and memorable learning experiences, making the process more fun and engaging.

Various games and platforms can be used in the classroom, depending on the context and purpose. Platforms such as Kahoot!, Duolingo and Khan Academy can contribute positively to the educational formation process, bringing together school content and typical game elements.

ARTIFICIAL INTELLIGENCE (AI) AND EDUCATIONAL DATA ANALYSIS

In recent years, technological advances have contributed to various sectors of society, including education. Among them, Artificial Intelligence (AI) stands out, which is a computational field that has been providing significant changes within the educational process, especially in the teaching and learning process. This integration of AI in education

offers unprecedented opportunities to tailor learning to the individual needs of students, being a crucial factor in improving educational effectiveness (Zawacki-Richter *et al.,* 2019).

Artificial intelligence has the ability to personalize teaching, offer instant feedback, from an intelligent tutoring system that meets the individual needs of students (Drigas and Ioannidou, 2012). And these are one of the main points that AI promotes in education, enabling a more effective and accessible teaching process.

Another technological innovation applied in the educational context is the analysis of educational data or *Learning Analytics* (AL) which is a process of collecting, analyzing and interpreting data related to the performance and behavior of students within the educational environment, with the aim of improving both teaching and pedagogical practices. The use of *learning analytics* is highly useful in education, helping to monitor student performance, data analysis, identify risks of failure and/or dropout, teacher interventions, tutoring, assessment, content adaptation, teaching personalization, feedback, recommendations, and reflection (Cardoso *et al.,* 2022).

The combination of artificial intelligence and *learning analytics* enhances the benefits of both technologies, promoting a more effective and personalized educational approach. This integrated approach allows optimizing teaching and learning processes, offering individualized support and improving pedagogical decision-making.

Guimarães Júnior *et al.* (2023) states that the personalization of teaching is one of the most significant advantages of analyzing educational data in conjunction with technology. This can be seen in the association between the use of AI and AL, where *learning analytics* collects data on student performance, including students' specific learning patterns and difficulties, while AI uses this data to tailor teaching in ways that significantly improve student engagement and motivation (Costa Júnior *et al.*, 2024).

For educators, these technological applications offer tools that help in lesson planning, construction of assessments, and feedback, as described by Zhu (apud Santos *et. al.,* 2024). Additionally, educational institutions can utilize AI to improve resource management and inform their strategic decisions.

Some tools such as *Squirrel AI, Coursera, Century Tech,* and *Carnegie Learning* use AI to personalize teaching according to the individual needs of each student. These platforms collect data on students' performance and use algorithms to adjust course content according to each student's needs, offering personalized exercises to help improve their skills. Another platform is *IBM Watson Education* , which uses AI to personalize teaching, as well as to provide personalized feedback to students.

VIRTUAL REALITY (VR) AND AUGMENTED REALITY (AR)

Much is discussed about the use of technologies in the school environment, as there is a duality regarding this practice. The knowledge and use of devices already familiar to students could increase interest in classes and productivity during the learning path, thus facilitating the transmission of knowledge between student and teacher and generating questions to be researched more deeply later, however these devices can also promote a dispersion of students' attention, making them seek, at the time of learning, moments of leisure or interaction among themselves. A possible solution to this problem could be equipment provided by the school where the only sites and tools available would be those that added to learning.

Virtual reality is not as far away as it seems to be, the use of applications and websites that help students in work and studies are already widely used. Seeking a balance between the facilities that technology can provide and the desire to encourage curiosity, interest and interaction in students, virtual reality can make addiction to social networks and applications become a thirst for knowledge and the search for learning. Virtual reality is defined by its immersive quality, providing an experience where the user has the genuine feeling of 'being' in the virtual environment (Slater and Sanchez-Vives, 2016). Virtual Reality (VR) together with Augmented Reality (AR) is an innovation in education because it enables the expansion of sensory aspects of didactic resources (provided by sound and 3D animations), and consequently, because it favors meaningful learning by simulating real experiences through virtuality (Silva, 2017).

In this context, these new technologies bring benefits to the most diverse areas of knowledge, including education, due to its breadth of application possibilities, (Lopes, 2019), and provide resources that facilitate not only pedagogical practice in areas such as science, engineering, and physics, but also contribute to the creation of resources that can expand and facilitate the learning of Libras by making it possible to interact and improve the sign in Libras (Carvalho, 2017). In this way, the use of these innovative tools can facilitate the integration of students with disabilities or special needs, providing a welcoming and inclusive environment, enhancing the quality of education.

In the educational field, the virtual environment can provide the development of practical classes through, for example, training in highly dangerous situations, eliminating risks and facilitating learning, as the skills developed in a virtual reality can be applied naturally to the real environment (Lavalle, 2018). With these technologies, the individual experiences achieved are able to transcend barriers such as language, as they can facilitate communication and bring students from different cultures closer together (Pedrosa

and Zappala-Guimarães, 2019). For an effective application of these tools, it would be necessary to solve some of the main challenges that limit this pedagogical approach, such as equipment costs, operational and operating limitations, students' discomfort during their studies, and difficulty in applying them to specific subjects due to the lack of material (Boyles, 2017).

According to Forte *et al*. (2018), we can understand augmented reality as a technology that is inserted in virtual reality, with the main objective of enriching the real environment from representations of virtual objects. Mediating the teaching-learning process between students is a task that needs constant improvement, in order to keep up with technological and cultural development, to make the learning environment more dynamic and attractive to students (Lopes *et al*. 2019). In this way, the application of educational innovations, such as VR and AR, are able to improve and facilitate the learning of abstract concepts from the sciences in general that can often be counterintuitive (Forte *et al*., 2018). The characteristics of augmented reality allow this technology to be more accessible, as they depend on more common tools, such as cell phones, markers printed on paper, and webcam (Kirner *et al*., 2009).

The use of these means of simulation can be shaped and applied to a variety of fields of education. Using peripherals that stimulate the senses, students can be "transported" virtually to different scenarios, such as virtual laboratories, natural habitats that are normally difficult to access, such as the seabed, Earth orbit, etc. Some virtual tools can be used to support these applications, such as "*Google Arts & Culture*, which allows students to explore various museums, art galleries and historical monuments around the world through 3D reproduced environments" (Junior *et al*., 2021). In addition, the applicability of these immersive practices can educate beyond the classroom, and can play an important role in raising awareness among the population. As an example, one can mention virtual museums, digital caves, trips to environments in their past, etc.

In this way, the greater power of immersion acquired by the use of VR and AR technologies is able to provide greater opportunities for experiences and allow students the possibility of developing their knowledge, at their own pace.

INCLUSIVE EDUCATION AND ASSISTIVE TECHNOLOGIES

Educational inclusion is a central issue in modern pedagogical practices, reflecting a worldwide concern for the right of all students to equal access to learning, regardless of their abilities. Inclusive education has emerged as a movement that seeks to transform

educational practices and structures to ensure that all students, including those with disabilities, can benefit from quality education.

The proposal is to meet this diversity in a broad and democratic way, integrating individuals into an educational system that values their potential and favors the development of essential skills. This concept is clearly evidenced in the Salamanca Declaration (1994), which affirms the need for an education that promotes the participation and learning of any student as part of a basic right of citizenship, going beyond the exclusive care of students with special needs.

The debate on inclusive education still faces barriers, especially with regard to the role of special education. While some advocate maintaining the traditional model of special education as a separate service, others advocate the complete dismantling of this model, favoring an adaptive support approach within mainstream education. More moderate perspectives indicate that, rather than dismantling special education, the focus should be on its evolution into an inclusive system support model, where specialized professionals offer support within the mainstream education environment. This view is corroborated by Ainscow (2005), who argues that inclusion is a fundamental right and should be integrated into educational policies and practices so that all students, with or without disabilities, share the same learning environment.

The practical implementation of inclusive education, however, is complex and requires significant cultural and structural change. One of the biggest challenges is to overcome attitudinal barriers, derived from prejudices and stereotypes around the biological and functional differences of individuals. These stigmas, deeply rooted in the social imaginary, often hinder the development of a truly inclusive education that values and respects human diversity in all its forms. In order for the education system to truly become inclusive, it is necessary that education professionals are trained and sensitized to understand and address these barriers.

In this context, assistive technologies (AT) emerge as an essential component to facilitate school inclusion and educational accessibility. Defined as a set of resources, devices, and services that promote the functionality and independence of people with disabilities, AT aims to expand the possibilities of communication, mobility, and learning. Radabaugh's (1993) phrase sums up the role of assistive technologies well: "For people without disabilities, technology makes things easier. For people with disabilities, technology makes things possible." This concept, reaffirmed by Cook and Hussey (1995), broadens the understanding of the role of assistive technologies by encompassing not only products and

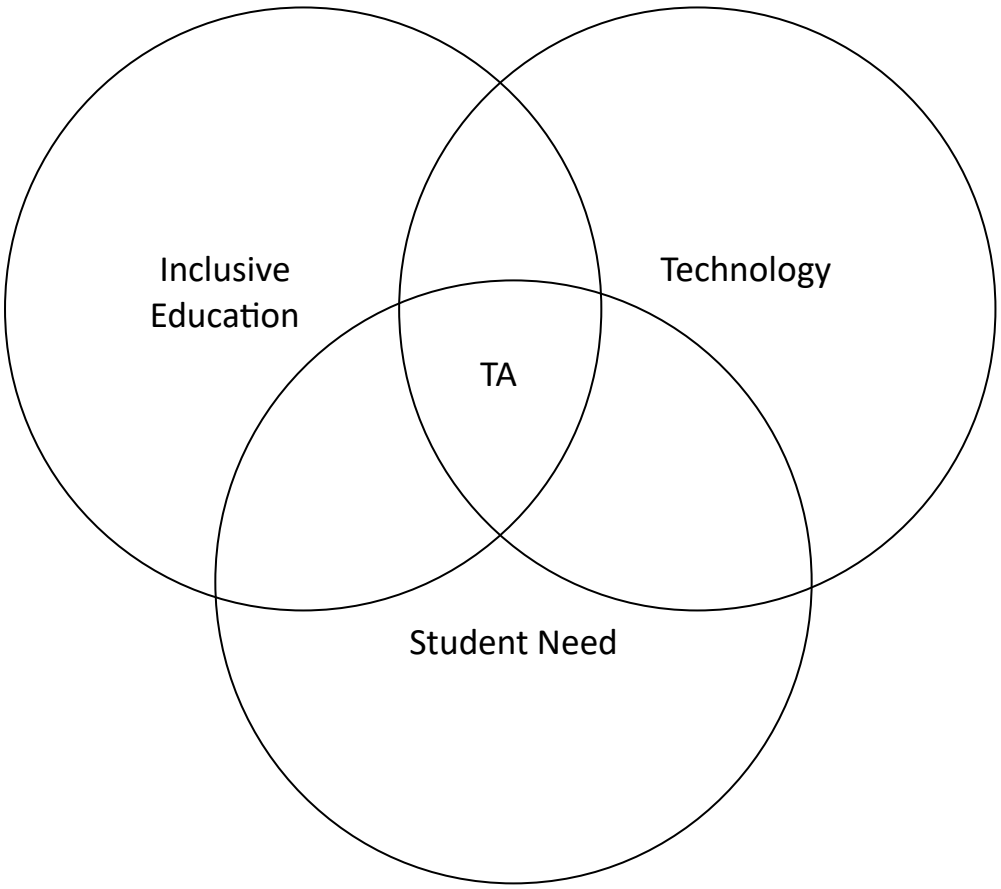
devices, but also practices and strategies that help to overcome functional limitations, allowing a more effective participation of individuals in the educational environment.

In Brazil, the concept of assistive technology was formalized by the Technical Aids Committee (CAT) in 2006, which defines AT as an interdisciplinary area aimed at promoting the functionality and inclusion of people with disabilities, through products and services that increase their autonomy and quality of life. This definition is in line with international conceptions, which consider AT an area that goes beyond the development of physical devices, encompassing practices and methodologies that favor inclusion and the development of competencies in a broad way.

There are two very important strands within AT. The first of these is Augmentative and Alternative Communication - AAC, this area of AT is responsible for serving individuals without functional speech or writing, and/or who have difficulty expressing their needs. The resources used by CAA are communication boards, built with graphic symbology, letters or written words that are used by users to express their questions, desires, feelings and understandings.

The second of the strands is Computer Accessibility. This area aims to enable access to the computer for students with disabilities, since its interface requires sensory and/or motor skills. This modality allows the computer to be adapted to the user's needs. With a simple tap on the "accessibility options" tab, the user can, for example, avoid repetition of letters, increase the size of the cursor, the font, promote key grip, making it easier to type with just one hand, with the option of using the number keys as a mouse, among other features existing in programming.

In the educational context, assistive technologies encompass tools that help in the teaching-learning process of students with various disabilities, such as dyslexia, hearing and visual impairment, among others. Reading software, such as Kurzweil 3000, and writing support applications, such as Read & Write, have been shown to be effective in facilitating the learning of students with specific difficulties, such as dyslexia, as discussed by Alper and Raharinirina (2006). In addition, in the case of students with hearing impairment, the role of the teacher is fundamental for integration and academic success, requiring not only the use of assistive devices, but also specialized training and close collaboration with specialized educational service professionals.



Through assistive technology, teachers have the opportunity to adapt curricular content and use methodologies that meet the specific needs of students with disabilities, promoting inclusion and socialization in the school environment. This scenario shows that school inclusion is not only a matter of rights, but also a practical need for curricular adaptation, teacher training and technological support. Assistive technologies, along with a change in the educational approach, become, therefore, an indispensable innovation for teaching in the twenty-first century, promoting an inclusive and transformative education.

FINAL CONSIDERATIONS

In summary, this paper discussed some of the main innovative approaches that are shaping contemporary education, detailing how these new approaches and technologies are being applied in classrooms and what impact they have on student development, educator training, and educational management. When dealing with the interaction between education and technology, its relevance in the modern educational context is highlighted. We live in a society in constant transformation, driven by technological advances, which requires an adaptation of educational practices to meet the demands of students who are immersed in an increasingly digital world.

One of the main obstacles is the resistance of some educators to adopt new methodologies and technologies, which can limit the potential of innovations in pedagogical practice. In addition, inequality in access to the internet and technological devices in different regions can result in disparities in student learning, compromising the effectiveness of teaching-learning.

In the midst of this search for advanced technologies, there is a need to integrate Information and Communication Technologies in school institutions, with the aim of improving the transmission of knowledge and enriching the learning process. In this way, it seeks to diversify teaching methodologies, creating a more interactive and participatory environment. With appropriate methodologies, the teaching and learning processes can be rethought, adapted to the current context and the reality of each place.

It is essential to consider that the integration of new technologies into the school routine of students and teachers can generate challenges, especially with regard to supporting pedagogical content. This scenario reveals a transformation in the teaching model, which is no longer centered exclusively on syllabus or on the figure of the teacher as the only center of the classroom. Traditional methodologies give way to more innovative changes, considering those imposed by society and the digital age. In this new context, the teacher is no longer the only holder of knowledge and assumes the role of facilitator, guiding students to face new situations in the classroom, in their daily lives and later in the job market.

It is essential to recognize that collaborative learning promotes the identification of new relationships, challenges established norms, stimulates creative actions, and introduces innovative elements into educational practices. ICTs offer students the possibility to build knowledge through communication and interconnection with a diverse environment, transcending social and cultural barriers. This process makes learning and experiences an ongoing and dynamic activity. Digital media emerge as facilitators of a more effective pedagogical approach, highlighting the importance of their proper use to strengthen and promote modern pedagogical practices in all school spheres (Silva *et al*., 2024).

The introduction of information technology has caused a transformation in the learning process, modifying the traditional dynamics of the classroom, based on chalk, blackboard and books, for an environment in which information can be accessed and shared virtually. In this new context, the computer is recognized as an essential tool for the process of acquiring knowledge, where educators and students can navigate in various information spaces, which allows sending and receiving various types of information in a virtual way. The advances in Digital Information and Communication Technologies expand

the possibilities of traditional teaching, both in material and methodological terms, resulting, already in various contexts, in advances in pedagogical practices.

In general, it is a challenge that requires continuous and combined efforts from all participants in the educational process. It represents an opportunity to reformulate and innovate pedagogical practices, preparing students for an increasingly digitized and competitive world. The future of education will depend on our ability to adapt to the new reality and use technologies effectively, for the benefit of students and society as a whole.

However, it is important to emphasize that educational technologies cannot and should not replace traditional tools in the teaching-learning process, but rather act as a means of interaction between student, teacher and knowledge. Thus, it is vital to adapt beyond traditional didactics, integrating modern aspects of digital education with conventional teaching.

In addition, it is crucial that institutions develop strategies to ensure that all students have access to these tools and that they can fully enjoy the benefits of new teaching methodologies. Future research should explore ways to overcome these challenges, seeking models that integrate technologies in an inclusive way and that promote a collaborative learning environment, taking into account regional particularities.

Therefore, while advances in educational technologies and approaches represent significant progress, it is essential that we continue to work towards truly accessible and quality education for all, preparing students for the contemporary challenges of the profession and society.

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SUSTAINABLE DIALOGUES: UNIVERSITY, TANNERY INDUSTRY AND ENVIRONMENTAL RECOVERY IN THE TERRITORY OF SAN BENITO

https://doi.org/10.56238/sevened2024.033-009

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ABSTRACT

This article presents the impact of the collaborative dialogues between the university, tannery companies and the territory of Tunjuelito, carried out within the framework of the project "Development of life skills (HpV) applying Good Manufacturing Practices (GMP) in tannery industries with the extraction of collagen from Wet Blue (WB) shavings". This project, organized by the National Pedagogical University and the Ministry of the Environment, was developed in Tunjuelito, particularly in the San Benito Ecoefficient Industrial Park Association (Asopiesb). The initiative is aimed at promoting the Sustainable Development Goals (SDGs) 3, 6, 8, 9, 11 and 13, promoting environmentally responsible practices, a transition to the circular economy through the conversion of WB into collagen and the recovery of the Tunjuelo River.

During the process, life skills were promoted in three areas: in the cognitive area, entrepreneurs recognized the environmental problems associated with their sector and considered innovative solutions, such as the use of artificial intelligence to optimize processes; emotionally, they reflected on the impact of their business decisions on environmental and community well-being; In the social sphere, dialogue and collaboration between businessmen, academics and community representatives were promoted to build joint solutions.

This interdisciplinary approach to education, technology and sustainability promotes future spaces for collaboration between the university, the business sector and the community, configuring a platform for the gestation of tangible changes towards a better quality of life in the territory and the development of future sustainable interventions.

Keywords: Life skills. Territorial dialogues. Wet blue shavings. Sustainability. Social responsibility.

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INTRODUCTION

The tannery industry faces significant challenges in balancing economic, social and environmental development. The United Nations Sustainable Development Goals (SDGs) provide a comprehensive framework to reduce environmental impact and improve the quality of life in this sector. In particular, SDGs 3 (health and well-being), 6 (clean water and sanitation), 8 (decent work and economic growth), 9 (industry, innovation and infrastructure), 11 (sustainable cities and communities), 12 (responsible production and consumption), and 13 (climate action) are fundamental to guide sustainable practices in the leather industry (United Nations, 2015; De Bogotá, 2015).

However, inadequate handling of chemicals, excess solid waste, and air and water pollution pose highly prevalent public health and environmental problems (Rodríguez & Cárdenas, 2023). An important global initiative to mitigate these effects is to promote the circular economy, which seeks to transform waste into useful resources. In the context of tanneries, this model promotes the conversion of *WB* into collagen, a by-product with applications in the cosmetic and pharmaceutical industries (Espinoza, 2023; Guevara Ruiz, 2024).

In addition, the strengthening of territorial dialogues between the university, industry and the community contributes to the implementation of sustainable practices and the development of life skills in the sector. In San Benito, these dialogues allow the university to act as a mediator, providing knowledge and tools that guide entrepreneurs towards the adoption of good manufacturing practices (GMP) and the protection of the Tunjuelo River (Díaz-Canel Bermúdez & Fernández González, 2020).

THEORETICAL MARCO

THE SDGS AND THEIR RELEVANCE IN THE TANNERY INDUSTRY

In the tannery industry, the United Nations Sustainable Development Goals (SDGs) provide a comprehensive framework to promote balance between economic, social and environmental development; in this industry, SDGs 3 (health and well-being), 6 (clean water and sanitation), 8 (decent work and economic growth), 9 (industry, innovation and infrastructure), 11 (sustainable cities and communities), 12 (responsible production and consumption) and 13 (climate action) are relevant(Naciones_Unidas, 2015) in the adoption of practices that reduce environmental impact and improve the quality of life of workers ((From Bogotá, 2015). However, the leather industry is one of the causes of the most common public health problems, generated by the improper handling of chemical products,

the amount of particulate matter in the air, soil and/or water and the excess of solid waste that is generated negatively impacts the environment (Rodríguez & Cárdenas, 2023).

CIRCULAR ECONOMY IN THE TANNERY SECTOR: TRANSFORMATION OF WASTE INTO RESOURCES

One of the global initiatives, which are led to mitigate the linear economic paradigm (extract, produce and dispose) is to train citizens who reuse the waste generated in their industries, who reuse, recycle and promote a circular economy that reduces waste and becomes useful material, in tannery companies, therefore, this economy promotes the transformation of wet blue waste into collagen, a by-product with commercial value in the cosmetic and pharmaceutical industry, especially ((Espinoza, 2023; Guevara Ruiz, 2024).

TERRITORIAL DIALOGUE: COLLABORATION BETWEEN UNIVERSITY, INDUSTRY AND COMMUNITY

Another paradigm shift that has been strengthened in the last decade is territorial dialogues, conceived as collaborations between various actors, especially the University, the industrial sector and the community and/or local policies, to address environmental and social challenges in an integrated manner; This approach fosters the implementation of sustainable practices and the development of life skills in the communities involved(Díaz-Canel Bermúdez & Fernández González, 2020): this cooperation promotes the implementation of sustainable practices and the development of HpV in the communities involved, in this sense, in San Benito, the territorial dialogue allows the current university as a mediator, providing knowledge and tools that guide entrepreneurs in the tannery sector towards the adoption of GMP and contribution to the recovery of the Tunjuelo River, to respect for the life of any species, that is, for life itself.

The tannery sector in the town of Tunjuelito faces significant environmental challenges due to its industrial practices, which affect water quality and surrounding ecosystems, particularly the Tunjuelo River. This issue highlights the need to implement sustainable practices and adopt circular economy models that mitigate environmental impact and promote community development. In this context, the National Pedagogical University, in alliance with the Ministry of Environment and the Association of Ecoefficient Industrial Park of San Benito (Asopiesb), developed the project "Development of Life Skills (HpV) applying Good Manufacturing Practices (GMP) in Tannery Industries with the Extraction of Collagen from Wet Blue Shavings". This project seeks to integrate the

Sustainable Development Goals (SDGs) 3, 6, 8, 9, 11 and 13, encouraging a transition towards more environmentally responsible processes.

The San Benito neighborhood is located in the town of Tunjuelito south of Bogotá D.C., an industrial, commercial and residential neighborhood, which represents 81.33% of the country's tannery sector, which, taking advantage of the proximity of the Tunjuelo River, discharge chemical inputs (chromium salts, sodium sulfide, slaked lime, etc.). ammonium sulfate, sodium bisulfite, enzymes, formic acid, acetic acid and sulfuric acid among others) and solid waste such as split leather, trimmings, sanding dust and shavings that have the highest load of organic matter (including wet blue or tanned leather shavings with high chromium content) (Galdos, Ramírez, & Villalobos, 2020; Sánchez Sánchez, Villamil Silva, & Pérez González, 2023).

The importance of this project lies in the urgent need to reduce the effects of tanning practices on the environment and the community. Through dialogue between the university, industry and the community, it is intended to raise awareness about the environmental impact and establish a collaborative approach to the recovery of the Tunjuelo River. In addition, the project encourages the development of life skills, essential for the adaptation of entrepreneurs to new, more sustainable production models.

Despite regulatory advances, the implementation of sustainable practices in tanneries remains limited. A lack of technical knowledge and resistance to change in the sector hinders the adoption of circular processes, such as the transformation of Wet Blue into collagen. The project addresses this gap through GMP training and raising awareness among local actors about their role in the sustainability of the territory.

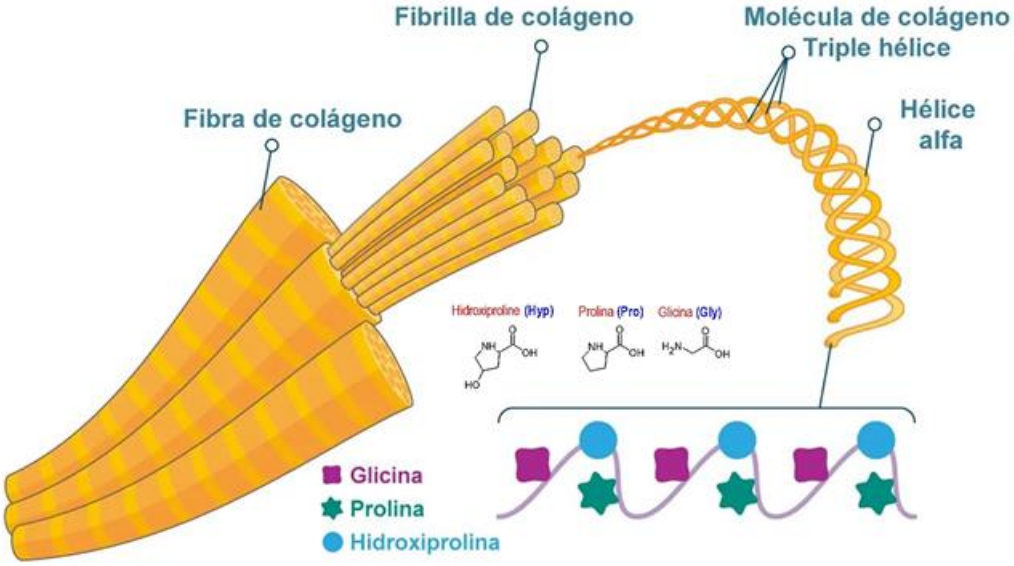
GOOD MANUFACTURING PRACTICES (GMP) IN THE TANNERY INDUSTRY

Good Manufacturing Practices are essential standards that ensure the correct handling and processing of products, reducing risks for both employees and the environment (Castellano Blandón, Lira González, & Monjarréz Picado, 2017). The application of GMP in tanneries not only helps to reduce the negative impact of the industry on public health and the environment, but also fosters a culture of sustainability and social responsibility within companies (Ayala-Garcia & Janssen, 2024). GMPs, integrated into the SDG framework, represent a key step towards sustainability in the tannery sector, driving practices that protect both workers and the surrounding ecosystem.

HYDROLYZED COLLAGEN AS A SUSTAINABLE BY-PRODUCT

Type I collagen, extracted from the shavings of chromium-tanned leather (WB), is a structural protein widely used in regenerative medicine and cosmetic products due to its properties to improve skin elasticity and firmness (Jiménez Cruz, 2014). The production of collagen from this waste represents a sustainable alternative that promotes the circular economy and reduces dependence on virgin resources. This practice not only contributes to the reduction of industrial waste, but also opens up new business opportunities for the tannery industry in alternative sectors, thus promoting economic diversification and sustainability.

Illustration 1 Collagen formation, from amino acids to fiber, taken from (Connect, 2019)



LIFE SKILLS (HPV) AND THEIR ROLE IN ENVIRONMENTAL EDUCATION

HPVs contemplate a series of skills (cognitive, emotional and social) that allow people to face and relate in a healthy way to the challenges and problems of daily life, challenging them to put into practice their knowledge, attitudes and values acquired in the course of life, make conscious and informed decisions, communicate assertively and effectively, however, this ability is linked to social support and to environmental and cultural factors in which people are immersed (Pardo Molina, Pinto Escobar, & Ruiz Arango, 2021). To promote the development of HpV in entrepreneurs, they are invited to participate in a training process for three days through the secretary of environment, in which 32 entrepreneurs registered and 22 attended, on the first day they are invited to participate in the calls for accompaniment and incentives offered by the secretariat, The results of the University's research are socialized around the findings of chromium residues, especially in water, soil, as well as alternative ways to mitigate these pollutants, on the second day,

entrepreneurs are invited to the University, so that they can learn about alternative ways to transform Wet Blue into collagen and the third day is carried out in their territory, to dialogue and establish emerging lines of rapprochement and awareness, as well as the exchange of cultural, technical, academic knowledge and research carried out by these companies to carry out a circular economy, to begin to consolidate ties between the different entities that lead to the fulfillment of the SDGs, the improvement of the quality of life of the population and especially that social responsibility with the river is identified, the people, the environment, that there is social and environmental justice (Ayala-Garcia & Janssen, 2024; Galdos et al., 2020; Pardo Molina et al., 2021).

The development of each of the stages made it possible to characterize the absorption conditions of the wet blue chips that would allow to obtain a high efficiency of chromium removal in synthetic and real wastewater (from the tanning stage), as well as to structure a pilot model of chromium removal from wastewater from wastewater. which favored the interest of businessmen in participating in the meeting coordinated by the Secretary of Environment between the businessmen of the territory of Tunjuelito, the university, thus allowing the promotion of HpV such as those unveiled through open dialogue to pronounce their fears to the participation of local proposals arising from the legislative entities, the identification of environmental problems in the sector, as well as the possibilities of working together with academic and technical institutions that accompany them in the processes and research that they carry out as entrepreneurs. In the same way, they learned about the results of research on the effects on health and the environment, tools such as Artificial Intelligence (AI) to optimize or accompany their research in addition to strengthening emotional skills, creating awareness about the impact of their decisions as entrepreneurs on the community and the environment, at a social level, the participants showed collaborative skills, where respectful, supportive and academic dialogue showed joint solutions that tended to the circular economy, but especially to recover the Tunjuelo River and biodiversity through GMPs.

The results show that sustainable dialogues between the university, industry and the community are key to driving the change towards a circular economy in Tunjuelito. The application of GMP and the production of collagen from Wet Blue show the potential of sustainable practices in the tannery sector, establishing a model that can be replicated in other industrial communities with similar environmental problems.

DEVELOPMENT

The research methodology had a mixed approach with exploratory-descriptive scope, carried out over a year, in four methodological phases (documentary review, design and implementation of a pilot model for the use of solid waste (wet blue) and a pedagogical and didactic strategy that favors the development of HpV, compliance with the SDGs proposed, as well as the circular economy and finally, By analyzing the results, new possible research can be established that strengthens territorial dialogues, the care of life, the planet and that all actions are for the common good.

In the phase of extraction and chromium-free purification of chromium-free collagen from wet blue and the design of the intervention with the entrepreneurs, a relationship of each of the phases of the research was proposed, tending to favor dialogue between the University, the Ministry of the Environment and businessmen in the territory of San Benito (town of Tunjuelito) as shown in table 1.

Board 1. List of research phases, objectives and intervention activities

PHASES	ODS	DESCRIPTION OF THE ACTIVITY	OBJECTIVE
Review of existing literature	8. Decent work. 11. Urban planning and biodiversity. 12. Production Responsible Consumption	Carrying out documentary analysis of the standardization in the extraction and purification of chromium-free collagen from wet blue Determination of optimal conditions for collagen extraction and purification	To obtain and standardize the extraction of chromium-free collagen from wet blue from the tannery industry.
Research Design Development	3. Health and Wellness 6. Clean water and sanitation 13. Climate action (implicit 8, 11 and 12)	Design of observation instruments, design of didactic material that allows characterizing cognitive skills (creativity, decision-making and criticality), emotional (empathy, tension and stress management) and communicative skills (conflict resolution, interpersonal relationships).	Design the dialogic intervention between the university and businessmen (territory) with the secretary of the environment
Design, selection of intervention activities, data collection and analysis	3,6,8,11,12 and 13	Elaboration of socialization material, talk, gamifiable material with the help of AI, BPM talk – workshop. 1. A virtual day, invitation to calls with the Secretary of the Environment, socialization of research on the impact of companies' waste on the environment. 2. Day. visit to the University (academia, secretary of environment and entrepreneurs) knowledge of the process of collagen extraction from WB, new challenges 3. Day. Dialogue in the Territory (Asopiesb): awareness-raising, AI workshop and new possibilities for rapprochement	Intervene in the business sector through BPM workshop talk and dialogic meeting (3 days)

Communication of results		Evaluate the intervention and generation of emerging categories	Assessment of the scope of the investigation

Source: The authors.

The table shows the articulation of the SDGs, the HpV that were intended to be developed by participating in the dialogues of the territory, university and secretariat of the environment, which allows evaluating the short, medium and long-term effect of the chemical substances used in the tanning process, as well as the effect on health. in the environment and generate social responsibility in the community, the family and created environmental values (Muñoz & Hernández, 2020)

RESULTS

As the interest is to evidence the results of the dialogue between the territory of Tunjuelito (the tannery entrepreneurs), the university and the secretariat of the environment, the results of obtaining collagen will be destined for another space; However, it is pertinent to socialize preliminary results of collagen extraction and standardization from Wet Blue (Tables 2 and 3) socialized to entrepreneurs, and dialogic inputs of the meeting are constituted, with the aim of generating an ethical reflection on the use of these results and being validated before marketing any type of product that can be used as raw material. where human and non-human health care prevails, as well as the environment in general.

Board 2. Physicochemical characterization of wet blue

Parameter analyzed	**Datum**	**Photo record**	**Observation**
pH water	4,05		The contribution of protein (dermal substance-collagen) in the solid residue (wet blue) is evidenced, making visible the presence of chromium, which should be promoted  WB from the router
Moisture %	52,40 +/- 0,11		
Ash %	4,60 +/-0,17		
Dermal substance collagen %	25,10 +/-0,46		
Crude fibre %	0,172		

Fat %	0,56 +/-0,06		
Carbohydrate %	17,20		
Cromo total %	0,48 +/-0,74		 Discarded WB shavings in the nearby neighborhood (Meissen)

Source. CIUP project DQU- 622-23

According to the data obtained, in table 2 it is observed that the protein parameter of WB (25.10%) indicates that it is a suitable material to extract collagen, however, it is observed how the proportions of tanning agents are maintained, since in the case of WB the tanning agent is chromium salts, for this a value of 0.48% is obtained. which indicates that it must continue to reduce the use of chromium to make use in other products, as a raw material.

Board 3 Characterization of collagen extracted by alkaline hydrolysis

Parameter Analyzed	**Value Obtained** Wet Blue	**Norm**	**NTC 3750 Parameter** Wet Blue1	**Photographic Record**
pH	12,78	NTC-ISO 4045	3-4 It meets this criterion because it was adjusted with H2SO4 0.2N	
%N	2.87 ± 0.01	NTC 1290	Minimum 1% Meets	
Total Solids (%)	4.01 ± 0.08	NTC-ISO 5433	5% Meets	
Ashes (%)	1.07 ± 0.12	AOAC 7.003/84930.15/90 (Adapted)	Maximum 1% Meets	
Heavy metals	Cr	7.73 mg Cr/100 g	AW 52.00	NA	

	Pb	LD<de 0,5 ppm Pb			
	Mn	LD<de 0,5 ppm Mn			
	Zn	0.12 mg Zn/100 g			

SOURCE. CIUP project DQU- 671-24

Table 3 shows the process of alkaline hydrolysis, showing that by this method the Cr(OH)3 (chromium hydroxide) of the WB chips is precipitated, the characterization of the pH, the percentage of nitrogen, solids and ashes, and the quantification of chromium to verify its removal, likewise, the concentration of other heavy metals was determined. such as lead, manganese and zinc, according to the Colombian technical standard NTC 3750 (Featured in 2011).

Table 4 presents the activities carried out in the three-day meeting with the entrepreneurs and the HpV developed in it.

Board 4. Favored HPVs

ability		Activities	Objectives	result
Emotional Skills	Empathy	Conversation with businessmen, the secretary of the environment and the university VIRTUAL CHAT exhibition of the ACERCAR call of the District Secretary of the Environment. https://www.ambientebogota.gov.co/acercar Socialization of research around the incidence of tannery products in the environment, cost/benefit ratios. VISIT UNIVERSITY Lecture and demonstration laboratory of collagen extraction, if as a pilot plant of wastewater to mitigate chromium. MEETING IN THE ASOPIESP TERRITORY Awareness-raising discussion through infinite quota. Workshop on the use of AI to improve quality processes,	To understand the business and labor culture of the San Benito tanneries through analysis of images, discourses and cases of the neighborhood context of the tanneries. Socialize calls proposed by the Ministry of Environment to promote SDG 12 Promote interpersonal communication, both verbal and non-verbal, between employers and workers that facilitate collaboration and effective (win-win) work. Raise awareness among entrepreneurs about waste management and produce economic efficiency, with fewer risks to the health and life of all beings on the planet. To encourage the entrepreneurial spirit and creativity of entrepreneurs to develop local meetings between people who work in tanneries to	Businessmen express fear when participating in these calls, since they expose themselves to being persecuted and made visible for not complying with the rules of control bodies. Horizontal dialogue, in which businessmen question the socialized results, generating controversy and cultural, technical knowledge in the processes that distort those obtained experimentally. Comments of learning and comfort in feeling part of research and being in the university as the main actors, mitigation of factors associated with the lack of knowledge of processes typical of science but that with experience manage them.
	Managing Emotions			
	Stress and Stress			
Interpersonal skills	Assertive communicatio			
	Interpersonal relations			

	Problem and conflict	expand research and have current theoretical references from a critical and ethical perspective. Alternatives for the use of chromium and circular economy. Presentation by businessmen about problems in the sector that require research, accompaniment, or other scenarios of dialogue between the different actors.	exchange knowledge and stimulate new forms of commercialization, leather management before, during and after the process. To generate a culture based on the reality of skin (with scars) that promotes the visual and odoric aesthetics of the context of tanneries, where the value is more for the meaning than for the economic value that is generated. Train workers and entrepreneurs in digital (AI) and technological skills suitable for a circular economy, where waste is minimized and the resulting waste is processed for other products that are friendly to the environment, life and the planet.	They reveal the need to establish real, long-term agreements, where there is permanent accompaniment, not only for the fulfillment of an activity, so it was invited to participate in offers with entities such as SENA, if the proposal is associated with innovation or other universities according to real interests and especially that lead to the fulfillment of the SDGs.
Cognitive skills	Self			
	Creative and			
	Decision Making			

Source. The authors.

Table five shows the meeting at the university and the one held in the territory of San Benito, through an infinite cube, designed with artificial intelligence (AI) to sensitize entrepreneurs, the effects caused to their own territory by waste and the lack of GMP in the process, as well as guide the use of AI to learn about other tanning alternatives. the ethical, responsible sense and always of evaluating the answers given by these tools.

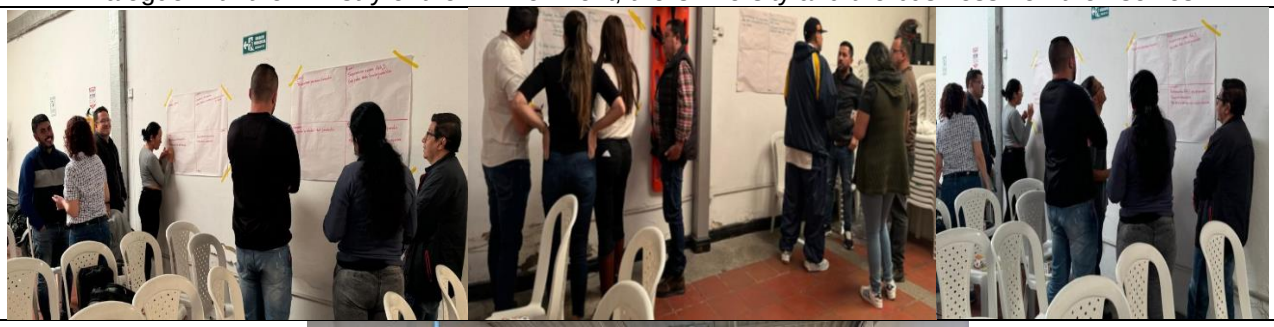
Board 5. Photographic evidence of business, academic and normative territory dialogues

Meeting of knowledge and territorial dialogues	
At the University	
	

In San Benito

Infinite Cube

Dialogue with the Ministry of the Environment, the University and the businessmen themselves



Source. The authors.

DISCUSSION AND RESULTS

1. **Strengthening the Circular Economy in Tanneries.** The integration of circular economy practices in the tannery sector, such as the transformation of *wet blue* waste into collagen, not only proved to be an environmentally viable alternative, but also generated new economic opportunities. This process illustrates how the industry can adapt to sustainability by reusing waste, thereby reducing its ecological impact on the Tunjuelo River and contributing to the Sustainable Development Goals (SDGs).

2. **Development of Life Skills.** During the dialogues, the entrepreneurs showed a remarkable growth in cognitive, social and emotional skills. The sessions helped build environmental awareness and a deep understanding of the circular economy and good manufacturing practices. This development is essential for the effective implementation of sustainable practices in the long term, strengthening the resilience of companies and promoting the adoption of new technologies, such as artificial intelligence.
3. **Horizontal Dialogue and Participation.** The project facilitated a space for open communication between entrepreneurs, academics and the community, allowing a flow of knowledge in both directions. This collaborative approach increased entrepreneurs' confidence in sustainable initiatives, although challenges were identified, such as fear of sanctions or the need for clearer regulations. The initiative demonstrated that a horizontal dialogue favors the co-creation of solutions and the commitment of local actors in environmental protection.
4. **Positive Impact on the Community and the Environment**. The implementation of Good Manufacturing Practices (GMP) and the focus on the circular economy contributed to the reduction of polluting waste in the territory of Tunjuelito. These actions highlight the key role that university-industry partnerships play in ecosystem recovery, setting a precedent for future interventions in other industrial sectors seeking a transition to sustainability.
5. **Proposal for Long-Term Strategic Alliances.** The results suggest the need to establish lasting strategic alliances between the university, the business sector and government entities to promote the adoption of sustainable practices and ensure support in the fulfillment of the SDGs. These alliances should be aimed at providing technical support and facilitating access to the resources necessary for the implementation of the circular economy, thus guaranteeing the continuity and sustainable growth of the sector.

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USE OF PLAY FOR THE TEACHING AND LEARNING OF PHYSICS (HYDROSTATICS) IN HIGHER EDUCATION

https://doi.org/10.56238/sevened2024.033-010

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ABSTRACT

The search for innovative strategies in the educational field has focused on the introduction of more dynamic approaches to improve the teaching of challenging subjects, such as Physics. Board games have been recognized as valuable tools in physics education due to their ability to make abstract concepts more tangible and accessible to students. They offer a practical and playful approach to understanding physical principles, transforming theory into practice through concrete situations. In this article, a board game involving Hydrostatics is proposed in order to facilitate the teaching and learning of students.

Keywords: Board Game. Teaching. Physics.

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INTRODUCTION

Physics requires challenging skills, such as abstract thinking, creativity, and experimentation, but they are not always fully developed in the students' education, making learning difficult (Fontes *et al.,* 2016).

Discussions about the introduction of playful games have gained strength in recent years (Flach *et al.,* 2020). In an ever-evolving educational landscape, incorporating innovative approaches becomes essential to inspire student learning.

Brandenburg, Pereira and Fialho (2019) emphasize the relevance of thinking about teaching approaches that help make learning easier. This entails analyzing and considering different methods, strategies, and approaches used to teach and assist students in absorbing knowledge more effectively.

The games are relevant because they present alternatives that indicate changes in teaching methods centered on the transmission of content (Fontes *et al.,* 2016). Within this context, didactic games emerge as transformative agents, offering an engaging and dynamic approach to the teaching of challenging subjects, such as Physics.

From this perspective, in this work a board game was produced involving Hydrostatics, a subject of Physics present in the discipline Bases of Physics and Chemistry Applied to Pharmacy, in order to facilitate the teaching and understanding of students on this subject, bringing in a playful way important topics about this aspect of Physics.

PLAY IN TEACHING

DEFINITION OF PLAYFULNESS

According to Sant'Anna and Nascimento (2011), the etymology of the term "ludic" derives from the Latin word "*ludus*", whose meaning refers to the idea of fun and play. We can say that using a fun approach to teach scientific concepts of Physics can be achieved through the incorporation of recreational activities, such as games.

The act of playing is inherent to the human being. Through games and toys, he replicates and reimagines the environment that surrounds him (Roloff, 2010). Playing and playing are essential in human development, crossing cultural and generational boundaries, enabling exploration, learning and interaction with the environment. By participating in games or play, people exercise creativity, imagination, socialization, and even cognitive and motor skills.

Play and play are present in the life of human beings in childhood, but not only in childhood, because they play and play throughout life.

Games and play are essential for children's development, offering fun and teaching

about rules, cooperation, and problem-solving. In addition, they are powerful educational tools. For adults, games are a form of relaxation, stress relief and strengthening of social relationships, and why not learning?

In short, the act of playing and playing is an integral part of human nature, playing a vital role in development, learning, and well-being, for both children and adults.

PLAYFULNESS AS A TEACHING TOOL

There are several paths for teaching and learning, however, there are also numerous challenges that slow down these factors. Among some all the tools to help teaching, and didactic games take a prominent place, for all age groups, from kindergarten to academic education. For Kishimoto (1998), playfulness should be allied to teaching and not be placed as an alien aspect of the educational world.

According to Moratori (2003), another positive aspect in using didactic games as a teaching tool would be to bring to people, through playfulness, and in a more relaxed way, the development of cognitive skills. The educational game needs to create an environment conducive to reflection, encouraging students to become aware of the construction of their own knowledge, offering pleasant opportunities for the development of their cognitive capacities.

Active learning leads to a better absorption of ideas, subjects and educational content, from more practical activities that offer people a closer contact with the content studied. According to Vygotsky (1998), at birth the human being lives in a constant process of knowledge and thus develops his psychological functions. With this, the experiences that people go through are fundamental for their development.

The difference in the pace of learning varies between students, this would be another advantage of inserting this teaching method in schools, colleges and similar educational institutions, the fact that it can regulate the difficulty of the games allows students to learn at their own pace and level of learning.

In summary, educational games represent a powerful tool in the context of teaching and learning. By incorporating playfulness into the educational process, they provide opportunities for the integral development of students, promoting not only the acquisition of knowledge, but also the strengthening of cognitive skills and the creation of an environment conducive to active and personalized learning. Therefore, by recognizing and implementing the potential of educational games, education can become more dynamic, engaging, and effective, catering to the individual needs and rhythms of students.

BOARD GAMES

Several types of games are available, and among the most common are board games (Fontes *et al.,* 2016), such as chess, checkers, various races, among many others.

Board games are entertainment activities that involve players using a physical board as a basis to perform moves, make decisions, and compete with other participants and that usually include pieces, cards, dice, or other tools to represent elements of the game and their rules determine goals, strategies, and interactions between players.

These games can range from classic games like chess and checkers to modern games that require strategy, decision-making, and social interaction. Board games are a form of entertainment that has been enjoyed by people of all ages and cultures throughout history. In addition, they have also been widely used in science teaching in general, such as the game entitled "Playful Strategy Applied to the Teaching and Learning of Analytical Chemistry", developed by Martins *et al*. (2024) for the teaching of Analytical Chemistry in higher education classes.

PHYSICS TEACHING

Teaching physics is critical to providing an in-depth understanding of the fundamental principles that govern the world around us. It covers a variety of topics, from mechanics and thermodynamics to electricity and magnetism, seeking to explain natural phenomena through scientific laws and theories.

As it is an experimental science, which seeks to understand the behavior of matter, Physics uses abstract models that seek to relate the macroscopic world with the microscopic atomic-molecular universe. This exercise is of great value for the development of the student's reasoning in any area of knowledge, but, at the same time, this abstraction is often one of the obstacles to its understanding.

We live in a society where the educational focus is on assessments, commonly recognized as teaching focused on tests (Moreira 2020). This approach often focuses more on memorizing information to meet the requirements of the tests than on developing critical thinking skills, creativity, and deep understanding of concepts.

The culture of "*teaching for testing*" can negatively impact the educational process. Students may feel pressured to memorize information without actually understanding the content, leading to superficial and temporary learning. Additionally, it can limit students' ability to apply knowledge in real-world situations, as the focus is more on test scores than on understanding subjects.

PLAYFULNESS IN THE TEACHING OF PHYSICS

Physics presents content that may seem a little complex and even daunting to some people, such as mechanics, electricity, optics, and hydrostatics. The presence of didactic games in studies can transform this experience into a moment of distraction and fun for students of the subject, making the content more accessible and understandable.

The application of educational games as drivers of the teaching and learning process, which can be used not only to improve teacher training, but also to teach physical concepts more effectively (Fontes *et al.,* 2016).

According to the study by Silva *et al*. (2021), it is feasible to attribute meaning to the knowledge acquired in the classroom through playful activities. Playful practices not only complement, but also enrich the understanding of the contents covered, providing a dynamic and interactive approach to the assimilation of concepts. Thus allowing students to experience physical phenomena through interaction with games, facilitating the understanding and practical application of the principles of Physics.

Interactive games offer students the opportunity to practice and solve physical problems, exercising critical thinking and analyzing and applying the formulas and laws of this discipline. Lopes (2001) emphasizes more forcefully the use of playful resources for the learning process, expressing the conviction that the assimilation of knowledge through games is considerably more effective.

According to Kishimoto (1994), during a recreational activity, the student assumes the role of protagonist in the learning process. Having more diverse and fun challenges brings the student greater motivation to learn subjects that previously seemed more complex.

Teamwork and knowledge sharing are other reasons that make cooperative games a more effective tool for teaching. Miranda (2002) points out that the game promotes the development of other facets, by suggesting "a work aimed at the exercise of skills such as group integration, mutual trust, leadership spirit, cooperation, decision, initiative, self-knowledge".

Thus, educational games not only complement traditional teaching, but transform the way students perceive and interact with the concepts of Physics, creating a more engaging, motivating and effective learning environment.

MATERIALS AND METHODS

The game developed in the present work was conceived with the educational purpose of exploring the principles of hydrostatics. Its focus lies in the practical understanding of concepts such as pressure, thrust, density, among others. The artistic part

was done on the computer by the design program "Canva".

Titled "The Race of the Droplets," the elaborate board game offers a unique approach to learning Hydrostatics. In this game, participants are immersed in a course where they face challenges and answer questions related to fundamental concepts of Hydrostatics. By advancing across the board, players not only strive for victory, but also deepen their understanding of pressure, thrust, and other aquatic principles.

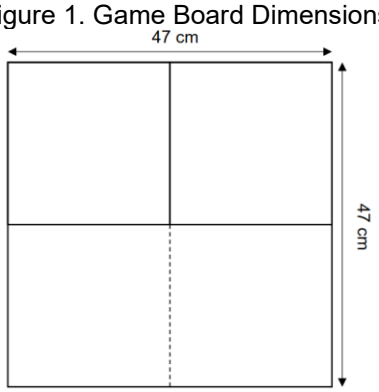
CONSTRUCTION OF THE GAME

For the construction of the game, the following were used: a sheet of Paraná paper; acrylic paint; brush; stylus; instant glue; sheets of A4 180 g paper to assemble the letters with the questions; adhesive paper to print the tray; a cardboard box to store the game; transparent adhesive plastic paper to customize the box; a dice and modeling clay to make the pawns.

In the preparation of the game, the following steps were followed:

1- To build the game board, a sheet of Paraná paper was used, and with the help of a ruler, a square area of 47 cm x 47 cm was measured (Figure 1) and then the stylus was used to cut the square of the board and make cuts to enable the folding of the board (Figure 2), after that, the back of the board was painted black (Figure 3). Figure 4 shows the ready-made tray.

Figure 1. Game Board Dimensions

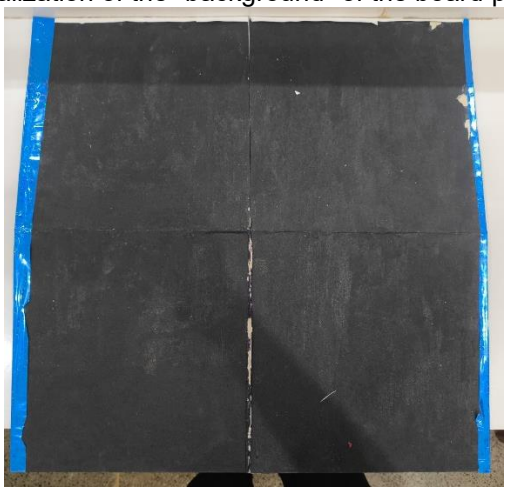


Source: The authors (2024).

Figure 2. Tray with its folds

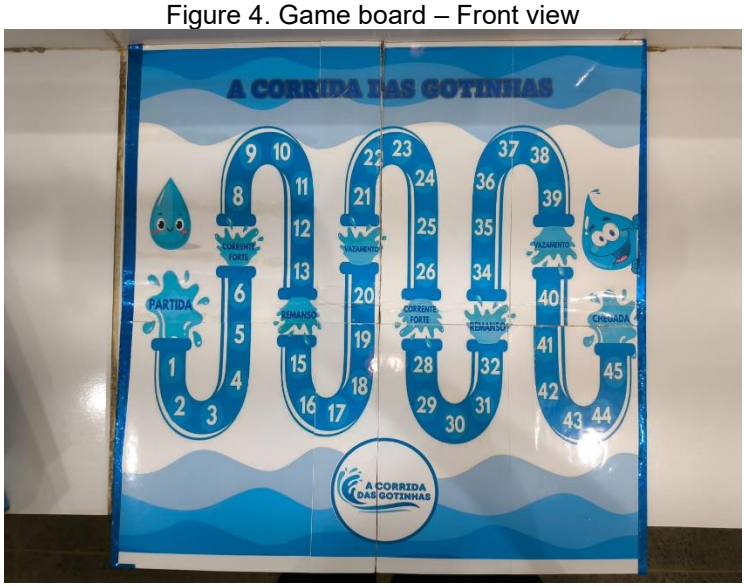
Source: The authors (2024).

Figure 3. Visualization of the "background" of the board painted in black



Source: The authors (2024).

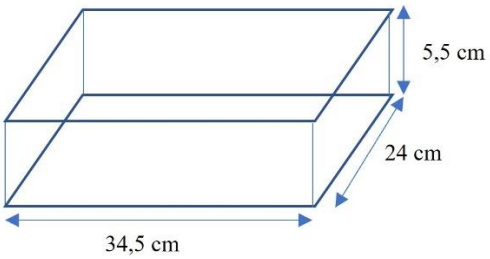
Figure 4. Game board – Front view



Source: The authors (2024).

2- To store the game board, as well as the other pieces of it, a box was produced in the dimension of 34.5 cm (length) x 24 cm (width) x 5.5 cm (height) (Figure 5), with cardboard paper, and transparent plastic adhesive paper was used to customize the game box (Figure 6).

Figure 5. Game box sizing



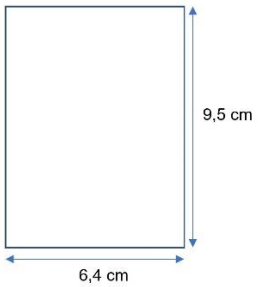
Source: The authors (2024).

Figure 6. Game box ready

Source: The authors (2024).

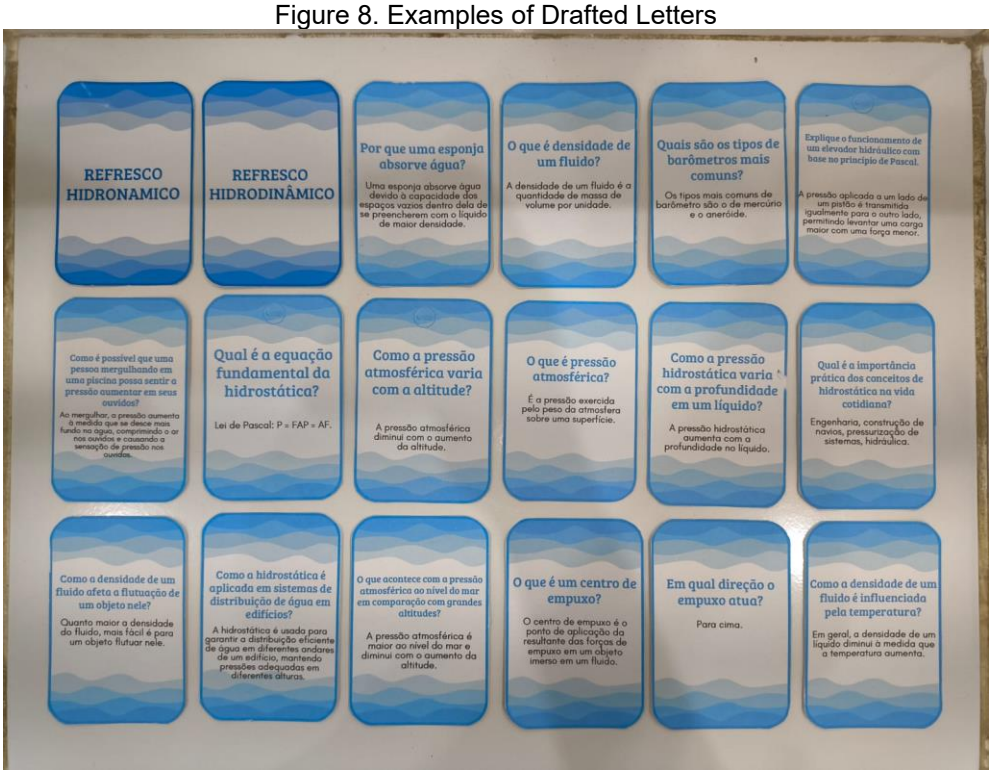
3- A total of 55 cards were prepared, in the dimension of 9.5 cm (length) x 6.4 cm (width) (Figure 7). The cards were printed on sheets of A4 180 g paper and cut out, the board art was printed on adhesive paper and then glued to the already cut board. Figure 8 presents examples of game cards. On each card there is a question and its answer.

Figure 7. Sizing of game cards



Source: The authors (2024).

Figure 8. Examples of Drafted Letters



Source: The authors (2024).

4- The four pins were made with modeling clay and painted in different colors (Figure 9).

Figure 9. Game Pins

Source: The authors (2024).

GAME RULES

Game components

The game is made up of the following parts:

- Board representing the water course;
- Challenge Cards with questions about hydrostatics;
- "Hydrodynamic Refreshment" cards for players who get three questions right in a row.
- Four pins.

Early Game

The game starts with the following rules:

1- Position the pawns/pins at the start.

2- Choose a player, apart from those who will be the pawns/pins, to be the judge of the game.

3- Shuffle the Challenge Cards and place them face down.

Player Turn

1- Roll the dice to determine the number of squares you will advance.

2- Advance the pedestrian along the route.

3- Do what you ask in the house you stopped.

4- If it lands on the common squares, the judge will take a card from the pile of cards and read the question to you.

5- If you get the question right you can walk 1 (one) more extra house, if you get it wrong you will go back 1 (one) house.

6- If you accumulate 3 (three) consecutive correct questions, you will win the Hydrodynamic Refreshment, so you can advance two extra squares in the next turn.

Judge of the Game

The judge will help maintain the integrity of the answers and provide fair play. The judge will also monitor each player's hits, ensuring that those who achieve three consecutive hits are duly rewarded with the Hydrodynamic Refreshment

House Types

The game features three types of house on its board:

• **Common Houses**: Take a Challenge Card and answer the question. • "Strong Chain" squares: advance 2 (two) squares.

• **"Backwater" houses**: Lose a turn.

• **"Leak" Houses:** Choose a player to go back 2 (two) squares.

Winner

The first player to reach the finish line after correctly answering the last question is the winner of "The Drop Race".

GAME TESTING

Lozza and Rinaldi (2017) point out that, when proposing to use playful activities in the classroom, four important precautions must be taken, the first of which is the prior testing of the didactic resource with the intention of avoiding unpleasant surprises at the time of its execution in class. Thus, after the pieces and rules were elaborated, the game was tested with all students of a class of the discipline Bases of Physics and Chemistry Applied to Pharmacy to evaluate it, perceiving the applicability of its rules and collecting possible modifications favorable to the good progress of the game and acquisition of knowledge (Figure 10).

Figure 10. Application of the game in the classroom

Source: The authors (2024).

DISCUSSION

The main result of the present work was the elaboration and elaboration of an educational tool aimed at learning Physics (Hydrostatics), to be possibly used in classes of introductory or conceptual disciplines, as is the case of the discipline for which the resource was elaborated (Bases of Chemistry and Physics Applied to Pharmacy).

For the elaboration of the didactic game, simple materials were used, easy to acquire, and cheap, which allows its reproduction in various academic spaces.

Studies indicate that most students have difficulties in learning Physics content and consider it an extremely boring subject with many formulas and calculations. However, when the discipline is not worked through playful methods, the chances of the student being interested in the content is much greater. Thus, the use of educational technologies such as the one described in this work makes the learning of Physics more effective and interesting since activities that are normally associated with leisure can also be associated with the classroom and studies.

Didactic games usually provide students with a competition to define the winner, and this leverages interest in the game and consequently learning, since to win they will have to make an effort to remember and learn the knowledge taught in the classroom. These tools are opportune for both students and teachers who can also relax when playing games (Dos Santos, 2018).

Felício (2018) points out that there is another applicability for a didactic game, which is the assessment of students' learning of the subject, since studies show that traditional assessment through tests does not correspond to the student's actual learning. Therefore, new methods of learning assessment have been sought and one of them is through didactic activities in which the teacher closely monitors the performance of his students.

The testing of a playful resource is important for it to be improved and so that there are no unpleasant surprises at the time of its actual execution (Lozza; Rinaldi, 2017). Therefore, a test was carried out by the team that developed the game, first only among its components and then with the other students of the discipline, with suggestions to improve the game being noted.

FINAL CONSIDERATIONS

Throughout this study, the importance of applying strategies for improvement and effectiveness in teaching and learning was seen. Therefore, board games proved to be a great teaching proposal.

The game created in this work aimed to test and bring knowledge of hydrostatics in a light and fun way to physics students. This innovative approach did not seek to impose a single method or replace traditional classes, but to be used as an extra resource to fix the contents of this area of the subject.

The playful approach, through games, has shown promise, offering a practical and engaging way to understand the principles of Physics. Activities conducted in a fun way have greater appeal and complexity, stimulate curiosity and interest, helping to absorb the concept more easily (Ferreira *et al*. 2021).

The use of educational methods based on playfulness has been shown to be highly effective in building more attractive learning environments for students. By incorporating games and playful activities into the teaching process, a dynamic space is created that arouses the interest of students, leading them to participate in a more engaged and motivated way.

A passive/expository model of the contents covered has contributed significantly to the demotivation of students in relation to Physics (Silva *et al*. 2019).

Board games, as highlighted throughout the study, provide an environment conducive to active and personalized learning, allowing students to learn at their own pace and skill level. In addition, these games not only complement traditional teaching, but transform students' perception and interaction with the concepts of Physics, creating a more dynamic, motivating and effective learning atmosphere (Kishimoto, 1998).

In view of this, the need to continue exploring and deepening the potential of board games as educational tools becomes evident. New research and pedagogical practices are fundamental for the development and creation of new games, as well as for their effective application in school environments.

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POSITIVISM AND HISTORICAL-DIALECTICAL MATERIALISM: EPISTEMOLOGICAL INFLUENCES ON BRAZILIAN EDUCATION

https://doi.org/10.56238/sevened2024.033-011

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ABSTRACT

Epistemology can be understood as the theory of knowledge, establishing a direct link with the ways of constructing and doing Science, with the deepening and understanding of the nature of the Sciences and their paradigms in the various areas of knowledge. The understanding of epistemological currents implies the theoretical and methodological guidance desired in scientific research. In this article, we will address some of the systems of epistemological thought that influenced the process of scientific production in the field of school education: Positivism and Historical-Dialectical Materialism. As a study methodology for such an approach, a literature review was carried out, adopting the approach of narrative review with support, in particular, in Gamboa (2012), Oliveira (2010), Vasconcelos (2017), Triviños (1987) and Saviani (2005), relating the epistemological bases for the construction of theoretical-practical thinking in the context of Education. With regard to Education from a positivist perspective, the influence of Comtean thought in the educational field was perceived through the curricular composition and the institutional organization focused on order and progress. With regard to Historical-Dialectical Materialism in the educational context, Marx's contributions to a popular and transformative Education, aimed at the emancipation of the dominated classes, judging the need for a distancing from traditional Education in elitist molds, is significant.

Keywords: Education. Epistemology. Positivism. Historical-dialectical materialism.

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INTRODUCTION

Epistemology is an area of Philosophy that refers to the process of knowledge development. It is the Philosophy of Science, as a reflexive-critical analysis of the process of scientific production from modernity, since the analysis of knowledge can be found in reports from Ancient Greece, since the pre-Socratic philosophers.

For Gamboa (2012), epistemology is literally the theory of science, being a meeting point between scientific research and philosophical categories. Critical reflection on the way we acquire knowledge permeates the various segments of the sciences. Despite the fragmentation of scientific knowledge into different specializations, the understanding of the origin of knowledge, the reasons why we know and seek information about what we think of reality is the object of epistemological study.

For Japiassu (1934, p. 25) "[...] epistemology is the critical study of the principles, hypotheses and results of the various sciences". It can be said that it is the philosophy of Science, the investigation of the nature of knowledge, in order to understand the foundations, justifications and veracity of a certain knowledge and conception.

In the area of school education, based on multidisciplinary sciences, that is, on the specialization of scientific knowledge in different areas, commonly divided and taught to students through a process of passing on fragmented and unconnected information, the study of the various epistemological systems, as a reflection of the origin of scientific thought, is of fundamental importance for the researcher.

According to Gamboa (2012), "epistemology applied to scientific research in Education has the fundamental role of constantly questioning this activity" (Gamboa, 2012, p.12). In this way, the critical analysis in the field of Education leads us to reflect on the role of the school in society, on scientific research on educational processes in institutional environments and on the role of Education for society.

These are just a few questions related to a social practice of fundamental importance for the promotion of citizenship of individuals as social beings, of individual complexities, endowed with potentialities, competencies and skills.

The possibilities of analysis in the context of school education, added to the broad dimension in the field of its complexities, can hinder the work of the researcher, with regard to methodological procedures, research paths and scientific approaches.

Therefore, the studies of the epistemological strands can facilitate the journey in the labyrinth of ideas during the construction of scientific knowledge, offering a "guide" in the development of research, through the existing currents of thought.

In this article, we will address some of the systems of epistemological thought that

have influenced the process of scientific production since the nineteenth century, and that still permeate the analysis of contemporary reality: Positivism and Historical-Dialectical Materialism. Such approaches will be treated with emphasis on their influences on the construction of scientific thinking in the field of school education.

As a study methodology for such an approach, qualitative research was carried out based on the systematic review of the literature on Positivism and Historical-Dialectical Materialism in Education. Qualitative research, according to Minayo (2001), aims to unveil reality through the study of elements produced by society such as values, actions, meanings and aspirations.

For the author, such elements cannot be analyzed through the quantitative perspective and are components that, due to the profound nature of the development given in the space of relationships, are fundamental for the social sciences, and cannot be reduced to the operationalization of variables.

For this article, the literature review was based, in particular, on the works of Gamboa (2012), Oliveira (2010), Vasconcelos (2017), Triviños (1987) and Saviani (2005), relating Positivism and Historical-Dialectical Materialism as epistemological bases for the construction of theoretical-practical thinking in the field of Education.

THEORETICAL FRAMEWORK

THE POSITIVIST CURRENT OF THOUGHT

The genesis of positivist thought is attributed to the Frenchman Auguste Comte (1798 - 1857). This epistemological current is based on the assumption that practical actions must be preceded by well-founded, methodologically systematized theoretical work with defined scientific bases before being implemented in society (Souza, 2020).

Starting from the social sciences as methodological inspiration, knowledge about society must be analyzed based on facts arising from observation, comparison and experimentation by the empiricist method. According to Comte's thought, the idea of a universal law for all phenomena, including those of a social nature, is also valid.

Comte creates the Law of the Three Mental States and the hierarchical classification of human knowledge, dealing with the first state, the theological one (a phase explained by fetishism, polytheism and monotheism); the second being the metaphysical (explanation of phenomena by abstract forces) and the third phase scientific positivism (the explanation of phenomena starts from scientificity and experimentation).

Due to the exclusion of metaphysical explanations, Triviños (1987, p. 40) classifies Positivism as being a "physical dogmatism and a metaphysical skepticism", in which

verification, experimentation and natural laws should be highlighted for the explanation and evolution of society. The metaphysical world is not in charge of the study of science.

In positivist theory, societies must evolve from stages, from the theological to the scientific, the latter characterized as the stage of reason, logic, the real, the advanced, as the positive stage of society. This progress between the stages would also be perceptible in human individuality, from childhood, through adolescence to adulthood, through a constant evolution, perceptible by maturation, being considered anomalous the cases that differ from the evolutionary logic.

The development of societies, for Comte, must occur through science and technology. The objective logic of facts, in the physical reality of matter, is the core for social analyses. It seeks, mainly, to discover how social phenomena occur, how they work and are repeated in society as a whole.

The organization of society is an important factor for social progress. From this reasoning, the social system must function without ruptures or revolutions that have shaken the current hierarchical order, the economic productive complex or any functional element of society so that, finally, the development of "social dynamics" can progressively occur.

> In Comte's understanding, society has two fundamental laws: social statics and social dynamics. According to the law of social statics, development can only occur if society organizes itself in such a way as to avoid chaos and confusion. Once organized, however, it can make qualitative leaps, and this is what social dynamics consist of (Vasconcelos, 2017, p.80).

The positivist current of thought had impacts in several areas of society, from politics to the military, in the formation of sociology to pedagogy. The Proclamation of the Republic, which took place in Brazil in 1889, was inspired by positivist ideologies with the act, among other actors, of Benjamin Constant (1836 - 1891), a former professor at the Praia Vermelha Military School, in Rio de Janeiro, and one of the main propagators of Positivism in Brazil (Vasconcelos, 2017).

In the field of sciences, Auguste Comte is considered one of the founders of Sociology as a modern science, given the emphasis of his analyses on societies and the systematization of studies of what he considered as social physics, later called Sociology, the science of social phenomena.

In the field of Education, Comte's thought had several influences that last until the present day. These influences range from the pedagogical method in school teaching to the organization of classrooms, as we will see later.

THE CURRENT OF HISTORICAL-DIALECTICAL MATERIALIST THOUGHT

The focus on the approach of Historical-Dialectical Materialism is led by Karl Marx and Friedrich Engels, both opposing classical German idealism in the 1840s. It is a revolutionary current of thought, especially because of the emphatic political and organizational vision of society.

Marx makes a social critique of capitalism and the ideas of the bourgeoisie in contradiction to the ideas of the proletariat. Mézáros (2006), from Marx's point of view, emphasizes that this is the current logic of the organization of capitalism: subjects are excluded in the name of inclusion. This inclusion in the capitalist system generates social disorder and the exclusion of the proletarian class in segments of society, especially political.

For Marxism, it is relevant to reflect on the dialectical and historical materialist conception. It can be said that historical materialism is the investigation of the historical evolution of societies, their transformation and evolution over time. Thus, society is a determinant of the subject, that is, the mode of production performed and the class where he is socially located, condition the social, political, intellectual and economic life of the subjects. On the subject, Trivinõs (1987, p.51) points out that:

> Historical materialism is the philosophical science of Marxism that studies the sociological laws that characterize the life of society, its historical evolution and the social practice of men, in the development of humanity. Historical materialism meant a fundamental change in the interpretation of social phenomena that, until the birth of Marxism, was based on idealistic conceptions of human society (Triviños, 1987, p.51).

The conception of dialectical materialism is the philosophical basis of Marx, who attempts to seek coherent explanations for the phenomena of nature, society and thought, that is, the dialectical interpretation of the world (Triviños, 1987). Thus, dialectics is the contradiction that presents itself in reality, in the situations and laws that govern society, and opposites and opposite situations are necessary to promote changes in ideals.

In summary, history is developed in a dialectical way, with the situations of thesis, antithesis and synthesis, resulting in the class struggle between bourgeoisie and proletariat. Soon this intensification would result in a revolution of the proletarian majority and the end of the class division and the capitalist system.

METHODOLOGY

The methodological trajectory addresses the processes of construction, investigation and articulation between the object of study, theory and results. It is necessary to clearly

delineate the factors and procedures that will be instrumentalized in the investigation, through the methodological contribution, in order to minimize the methodological gaps for the construction of a thesis, in this case. Like so

> We outlined the methodological issue, aware of the importance of reporting the process of knowledge construction offers others the possibility of retracing the path and, in this way, analyzing the statements we make when articulating theory and empirical around an object (Carvalho, 2014, p.46).

The present work is qualitative, this approach occurs through the instruments used for data collection and analysis, whose interpretation occurs in a deep and detailed way.

> Qualitative research is descriptive. The data collected is in the form of words or images and not numbers. The written results of the research contain quotes made based on the data to illustrate and substantiate the presentation. The data include interview transcripts, field notes, photographs, videos, personal documents, memos and other official records (Bogdan and Biklen, 1994, p.48).

The methodological procedure of this research is based on literature review, adopting the narrative review approach. As defined by Mattar and Ramos (2021), narrative revision is an expression often used to describe revisions that do not follow a systematic method, also known as traditional revisions. For the authors, the narrative review usually does not perform systematic searches in databases or apply specific selection criteria for the results obtained.

Also according to Mattar and Ramos (2021), several authors claim that the boundaries between narrative and systematic reviews are not clearly defined, so much so that some studies call themselves narrative systematic reviews or systematic narrative reviews. Maroldi, Lima and Hayashi (2018), when conducting a narrative review on the scientific production related to indigenous education in Brazil, indicate some methodological steps, but fail to provide sufficient criteria for the replication of the study, an essential element for the characterization of a systematic review.

Narrative review is by nature selective, covering only the literary material and evidence that is readily accessible to researchers at the time of research. For this work, the productions of Gamboa (2012), Oliveira (2010), Vasconcelos (2017), Triviños (1987) and Saviani (2005) were selected as theoretical foundations that support the narrative review carried out here.

The book "Research in Education: methods and epistemologies" by Silvio Sánchez Gamboa addresses the main methods and epistemologies applied in research in Education, highlighting the methodological diversity and paradigmatic conflicts present in educational research. The work discusses the importance of recognizing the plurality of

approaches and the necessary relationship between research methods, theoretical framework and epistemological assumptions, relevant to the analysis of the epistemological currents of this work.

The text by Claudemir Gonçalves de Oliveira, called "The Positivist Matrix in Brazilian Education", examines the gateways of this philosophy in the country, its modifications and the impact on the educational and political spheres, focusing on positivist education and its implications during the First Republic.

The work of José Antônio Vasconcelos - Philosophical Foundations of Education (2017), contributes to the philosophical premises that lead to the epistemology of Education, with theoretical input from idealist precursors such as: Plato, Aristotle, Kant, Rousseau, Comte, Durkheim, Marx, Engels and Rorty. The importance and influence of each theoretical current in pedagogical thought is provided

Another relevant author on the theme addressed in this article is Augusto Triviños (1987), with his work entitled "Introduction to research in social sciences: qualitative research in Education: reflective practice", which addresses the theoretical currents of Positivism, Marxism and Phenomenology. This brings the main perspectives of the strands mentioned in the methodological scope for research in the social sciences, being an important theoretical-methodological reference and guide for qualitative studies.

The book "Historical-Critical Pedagogy: First Approximations", by Dermeval Saviani, addresses the foundations of historical-critical pedagogy, an educational proposal based on Historical-Dialectical Materialism, the literary basis for the analysis of this current in Brazil. The work presents a critical view of the main pedagogical currents, such as traditionalism, the new school and technicist pedagogies, proposing the overcoming of these approaches through an Education that values the formation of the critical consciousness of individuals and the role of the school as an institution responsible for the socialization of scientific knowledge.

RESULTS AND DISCUSSIONS

THE INFLUENCES OF POSITIVIST THOUGHT IN THE EDUCATIONAL FIELD

Comte's positive philosophy proposes that the development of society occurs in stages, from the simplest to the most complex, from the theological to the positive. From this assumption, there is a progressive order in the possibility of understanding the being according to the maturation of the individual, from childhood and its connection with the fanciful, the supernatural, through adolescence with the abstraction of the partial

understanding of reality to empirical scientific knowledge, tested and verified by rules, as a cognitive value of adult maturity.

The positivist current, as attributes of development, considers the order, organization, and usefulness of knowledge for the reality of material and concrete life to be of fundamental importance, thus opposing teaching with a metaphysical focus or curricular bases with content considered without practical foundation, such as the teaching of Latin in schools (Souza, 2020).

In school institutions with positivist influence, the assumptions of organization and order were put into practice in the organization of classrooms in rows of tables and chairs, with the teacher in front of a blackboard passing on scientific content, all tested and proven by the scientific community (Tiski, 2000).

The knowledge considered useful and concrete is that which, rationalized and subject to empirical methods of proof, is passed on to students according to the classification of complexity, from the simplest to the most complex, according to Oliveira (2010) when analyzing the proposal of the positivist course, from mathematics and astronomy to the natural sciences and sociology.

For Comte, in Oliveira (2010), the reform of society must begin with intellectual improvement, passing through morality and finally politics. Thus, the role of Education as a driver of a positive society is fundamental because scientific teaching is the basis of the desired progress.

According to Souza (2020), there is a need for positive thinking, through theoretical education, so that positive action occurs, through practice. From this perspective, it is possible to identify the importance of educational institutions as providers of the knowledge necessary for the constitution of a positive society.

The understanding of common knowledge, as a basis of general knowledge, which branches out from the process of specialization of the sciences, is defended by Comte as a rationalized method of instruction because, according to the author,

> In order that natural philosophy may complete the regeneration, already so prepared, of our intellectual system, it is therefore indispensable that the different sciences of which it is composed, present to all intelligences as different branches of a single trunk, should be reduced at first to what constitutes its spirit, that is, its principal methods and its most important results (Comte, 1978, p.15).

Thus, it is from the understanding of a common basis for the sciences that positivist thought considers a hierarchy of scientific branches, establishing the Comtean encyclopedic classification, dividing phenomena into inorganic physics (astronomy,

terrestrial physics and chemistry) and organic physics (physiology, sociology), with the understanding of the second group depending on the understanding of the first.

Thus, it is understood that there is a logical sequence of knowledge that must be acquired for a positivist education. According to Tiski (2000), when analyzing Comte's thought through the study of the positivist training course, school knowledge for the formation of an advanced society must be real, useful, certain, precise, organic, relative and sympathetic.

The influence of positivist thought in Education was of great amplitude in Brazil, whether as a parameter for teacher training, or for the construction of curricular bases for teaching and pedagogical practice, the epistemological current in question was paradigmatic in the Brazilian educational sphere as we will see below.

THE BASES OF THE POSITIVIST CURRENT IN BRAZILIAN EDUCATION

The direct influence of positivist thought in Brazil occurred from the constitution of the First Republic, with the presence of positivists in important political positions in the federal government. One of them was Benjamin Constant, who held the position of Minister of Public Instruction, Posts and Telegraphs in the government of Marshal Deodoro.

In 1890, the then ministry responsible for educational policies proposed the so-called "Benjamin Constant Reform", which, according to Corrêa (2010), had an encyclopedic character by including scientific disciplines such as Biology, Chemistry, Mathematics and Astronomy, in addition to the consecration of serial education. That year, the reform took place in the Federal District, then the city of Rio de Janeiro, replacing the academic teaching in force until then. Under the reform, 21 decrees were approved, most of which dealt with the educational institutions maintained by the federal government in the city of Rio de Janeiro. According to Freitas (2015),

> The reform included scientific disciplines, since the disciplines offered, until then, had a humanist influence and this authority caused scientific disciplines to be excluded, so the curriculum of the gymnasium consisted of seven years and scientific disciplines predominated in relation to classical or humanist disciplines (Freitas, 2015, p. 2).

The disciplines offered until then were influenced by the teaching model implemented by the Jesuits, such as Latin and Rhetoric. The Benjamin Constant reform proposed the implementation of disciplines such as Trigonometry, Physical and Natural Sciences, considered by the positivists as of a scientistic nature.

A contradictory point of Constant's reform, in the context of positivist thought, would be the implementation of the discipline of Sociology in junior high school (equivalent to the

second stage of elementary school today), since in theory this science should be better assimilated to adults, and not to adolescents.

It was the inspiration for the technicist current that predominated in the Brazilian pedagogical sphere during the military dictatorship (1964 - 1985).

For Rouanet (1987), technicist pedagogy inherited from Positivism the submission, in part, of the human sciences in comparison to the exact sciences or those of a technical nature, resulting in negative effects for the country's Education. According to the author, the suppression of disciplines such as philosophy and history, the latter which ceased to be autonomous, created a nation of "competent zombies and lobotomized doctors" (Rouanet, 1987, p.306).

Still in the critical sense, the positivist proposal of order and progress, considering any form of protest or conflict as pathological, benefited the military regime and the dominant elites since the permanence of the status quo is beneficial to appease any contestation to a system of domination of the popular masses.

In the opposite direction to technicism, inspired by positivist thought, we will see below how the epistemological current based on Historical-Dialectical Materialism influenced the educational context.

HISTORICAL-DIALECTICAL MATERIALISM IN THE EDUCATIONAL CONTEXT

The contribution of great Marxist thinkers in this area is notorious. We have the example of Louis Althusser reporting that Education is a vehicle for the transmission of the dominant ideology, with the main objective of social control established by the bourgeoisie. The Critical Reproductionist current, created by the same author, evidences the ideological characteristic of school education, which is an instrument of the dominant class for the perpetuation of the current social conjuncture, referring to the bourgeoisie (Vasconcelos, 2017). It is clear that school education is the necessary contribution to the emancipation of the working class.

The current of historical-critical pedagogy, also biased in Marx's perspective, identifies the social control that Education and the school carry out in society, especially in young people, but understands that Education must be contradictory to this situation, fostering critical consciousness. This critical awareness helps in the understanding of social transformations and actions, leading to a reformulation of classes.

One can highlight as a precursor of this current of educational critical renewal, the Italian Gramsci, highlighting that at the beginning of the twentieth century there were two types of school education, the academic and the professionalizing. The first offered to the

socially privileged public, has an academic and intellectual nature and is a study with a longer period. Vocational training, the name itself emphasizes the need to professionalize, is offered to the less favored classes with the objective of a rapid technical professionalization for entry into the labor market. In this way, this type of educational model contributes to the continuous submission of the working class determined by the social elite (Vasconcelos, 2017).

Aiming at alternatives against these two situations, Gramsci created the unitary and public school, where the mass layers of society could study and evolve intellectually, allowing workers to leave the condition of subordination and move towards a seizure of power. In a quick contemporary analogy, we realize that the two educational models previously reported (academic and professionalizing) are still in force and with the same specificities and objectives. This confirms the social segregative character that was pointed out to them at the beginning of the twentieth century, perpetuating until the present moment.

Gramsci also played a relevant role in the role of culture and hegemony that the elites had over it, recalling the need for one of the historical-cultural heritage of humanity to be transmitted to the next generations, and with ideological values specific to the subaltern classes (Martins, 2021).

The reformulation and criticality of the traditional educational system to serve the mass social classes is a foundation already prophesied, but which is still in constant search for methods, successes and quality. In a conclusive way and collaborating with the theme, Monasta (2010, p. 340) makes the following statements:

> [...] with reference to the traditional education system, Gramsci's position does not mean that school and university education is irrelevant in the context of the strategy of education oriented towards critical thinking. However, it is a matter of innovating the methods, contents and organization of the study based on the following caveats: a closer link between school and work, between theory and practice; a greater attention to the history of the organization of work and culture and, consequently, a greater interest in the study of the "fortune" of the classics and theories, that is, in the study of the different interpretations they have had in history. Finally, but of great importance: an open debate on the objectives of education and on the values underlying educational action in a given society (Monasta, 2010. p. 34).

By relating school education to work, the critique based on Marxist thought encompasses the yearnings of the popular masses, the working class and the population historically harmed by the logic of capitalist production. When analyzing Rural Education, Caldart (2009) relates the need for technical knowledge for rural activities and the criticism in which an effective Rural Education should promote to the capitalist mode of production in which, according to the author, "[...] delegitimizes the original protagonists of Rural Education as producers of knowledge and who resist building their own references for the

solution of problems of another logic of production and work that is not that of productive work for capital" (Caldart, 2009, p. 38).

The influence of Historical-Dialectical Materialism in the context of school education is present in the criticism of the meaning of teaching for the reality of those who most need the school institution as a possibility of social change, the working class. Studies on the education of peasants, workers, indigenous peoples and other marginalized communities in the capitalist production system were deeply based on the Marxist current of thought.

The criticality of traditional education is an important contribution that should collaborate with reflections on new approaches and methods by the working class for an emancipatory education. We will see below how the influence of this Marxist thought, focused on the method of Historical-Dialectical Materialism, occurred in Brazilian educational research and practices.

HISTORICAL-DIALECTICAL MATERIALISM IN THE BRAZILIAN EDUCATIONAL CONTEXT

So far, Historical-Dialectical Materialism has guided scientific research, especially in relation to Education. With a focus on Brazil, we can see its greater influence in the second half of the twentieth century in the research that stands out educational theories, especially with the critical bias of this epistemological current.

Research in Brazil had different focuses on the bias of Historical-Dialectical Materialism, this is due to the various international authors studied and the different interpretations that they had of the aforementioned current over the years.

Dermeval Saviani (2005) is an important scholar on the subject in question and reports that his research, involving the bases of historical-critical pedagogy, has a character of collective elaboration and is being produced through the analysis of the mode of production, seeking to "understand the educational issue based on objective historical development" (Saviani, 2005, p. 88). This also refers to the "historical-proletarian conception of culture" seeking to create alternatives to the bourgeois ideological character that Brazilian public schools constituted, stating that "educational work is the act of producing, directly and intentionally, in each singular individual, the humanity that is historically and collectively produced by the group of men" (Saviani, 2005, p. 13).

A bias of Marxist Education that is widespread in Brazil goes against collective education, more precisely popular. Vasconcelos (2017) points out that there are three main strands of understanding this terminology, the first of which, in the Marxist view, is understood that work is something important in the life of the individual, but popular

education should not be limited only to this segment. Marx makes a critique of vocational education that is mainly aimed at the working class.

In a second line of understanding, the need that the working class must have for the appropriation of cultural goods made and consumed by and for the bourgeoisie is highlighted, aiming at cultural emancipation and less economic and social dependence on the dominant class.

The third analysis states that Education is popular and can be formed by this social class, and that it is not only the elites who maintain and are responsible for its creation and dissemination. An important author who shares this theme is Freire (1987), bringing cultural and everyday elements of individuals to the literacy of the "mass class", terminology used by the author himself.

Most of the Brazilian intellectual production, related to studies in the area of Education with perspectives on Historical-Dialectical Materialism under the Marxist bias, deals, above all, with the last two stages of Popular Education described above. Based on a mediating Education between teacher and student, taking into account the cultural aspects present and, in this way, building a transformative and popular Education.

CONCLUSION

Epistemology is necessary in the process of developing scientific work, through the deepening of the understanding of the nature of the Sciences and their paradigms in the various areas of knowledge. The study and understanding of the epistemological currents addressed in this article (Positivism and Historical-Dialectical Materialism) demonstrate that research in the educational field can be guided by theory and method, aiming that the practice and possible conclusions are grounded and concise, coming from the rigor that they require.

Both epistemological currents have representativeness in the educational field and lead us to understand and reflect on the methods, theories and praxis of Education with a comprehensive look, focused on society and the educational model, especially the contemporary one, allowing us, from there, to analyze new strategies and decision-making.

Comtean Positivism, specifically through the ideology that through order comes progress, still permeates society, including in the educational field, through the organization of classrooms in rows or through rigid schedules accounting for the time of each subject. Despite the criticism of the positivist method, in Brazilian schools Comtean thought continues to influence the daily life and the objectives of school education desired by parents and teachers.

Historical-Dialectical Materialism had its influence in the educational field through the reflection on the role of Education as a promoter of social development. Popular and emancipatory education is still a project that finds implementation difficulties due to the educational structure, dominated by the interests of neoliberalism and the dominant political-economic class.

It is pertinent to add the influence of Marxist thought in studies related to Rural Education, quilombolas, indigenous communities and others, considered as schools of resistance to the logic of perpetuating the submission of pedagogical models related to the interests of the economic elites. Among the authors cited in this research, we highlight the works of Roseli Caldart on the rural school and Paulo Freire, regarding his methodology of literacy for adults.

As a result of the studies in this article, we realize the importance of the influence of the epistemological currents analyzed in the context of Education. Perceiving how such currents of thought contribute to the concrete reality in the school environment, through educational policies, the construction of curricula and the organizational composition of school units is fundamental to understand the context of Education among its most varied dynamics, enabling the advancement in scientific deepening for better propositions in the improvement of educational policies and practices.

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KNOWLEDGE OF THE BRAIN – REASONS FOR SCHOOL SUCCESS

https://doi.org/10.56238/sevened2024.033-012

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ABSTRACT

The aim of this article is to raise awareness of the impact that knowledge of the brain can have on the profitability of the teaching-learning process. As an opinion piece, the aim is to reflect on the reality of schools, which must be based on the paradigm of quality, both quantitative and qualitative; which inherently requires knowledge of the brain, the noble organ of learning at a structural and functional level. The foundations of this process can be found in knowledge from educational psychology, pedagogy and neuroscience. It is also essential for educators to devise strategies that are optimized and compatible with the teaching-learning process. It is recognized that there is a long way to go and a lot of good research needs to be carried out. We also understand the openness to other research paradigms.

Keywords: Brain. Teaching. Learning. School performance.

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INTRODUCTION

Currently, it is believed that no one questions that it is necessary to know the brain better if we want higher quality education. In this way, knowing how the brain, the noble organ of learning, is constituted, how to develop and make it profitable, are important premises, to be considered, if we really want a school with more quality. All of this is justified by the relevance of knowing how the brain works, as well as the satisfaction of sharing this information with teachers.

From Spitzer's (2007) perspective, a cook to work with higher quality should know how digestion is processed. That is, if he understood the process of digestion in the various stages from a structural (anatomical) and dynamic (physiological) point of view, he would have a better chance of success. Just like the beautician, if he knows what the skin is, which constitutes our natural frontier and by knowing it from an anatomical and functional point of view, this organ will certainly be better professional, which will allow him greater "*Know How*" in his intervention in a professional capacity. So, what happens to the professional who works to teach, if he has deep knowledge at the structural and functional level of the brain (as we know, he constituted the noble organ of learning), can't he be a more competent professional? These are questions of this nature that we will analyze, based on the knowledge coming from educational psychology, pedagogy and neurosciences. Relatively recent research (e.g. Jamaludin, Henrik, & Hale, 2019; Moreno, & Schulkin, 2020; Thomas, Ansari, & Knowland, 2019), corroborate this perspective. In this logical sequence and according to Torrens (2019), everything that educators have always had the ambition to know about the brain of their students, which helps a better knowledge of human nature and the teaching/learning phenomenon.

SO, AND WHY THE BRAIN?

Inside our braincase, a fantastic organ is housed, which weighs about 1,500 grams. It is made up of billions of small cells (neurons), which allow us to feel, hear, think, dream, speak... The human brain is considered the most complex organ in the body and most likely on earth. Several authors (e.g. Aires, 2022; Eagleman, 2017; Lashley, 2014; Kaku, 2014), believe that when the brain is better known, we will necessarily have a more fruitful brain.

Many researchers believe that the better we understand the human brain, the more capable we will be of devising strategies that are compatible with how we best teach and learn (e.g. Ansari, Coch, & Smedt, 2011; Blackmore, 2010; Erlauder, 2003; Fisher, 2009; Howard-Jones, 2018; Howard, Jones, Wasbrook, & Meadows, 2012; Thomas, Ansari, & Knowland, 2019; Toukhama-Espinosa, 2014; Wolfe, 2004).

We are still in very morning regions with regard to the knowledge of the constructs of perception, memory, emotions and associations with the school environment; But the potential of the area of neurosciences to improve the teaching/learning process and cognitive processes is recognized. It is also recognized that the road to be covered would be long, but a considerable journey had already been made.

OECD (2002; 2007), Goswami (2004; 2005), Stern (2005), Howard-Jones (2009; 2014; 2017; 2018), among others, have provided significant research, already in a remarkable number.

In Hennemann's (2015) criterion, neuroeducation offers us a more detailed approach to learning. Neurosciences tell us that our brain has enormous plasticity, undergoing profound and constant changes, if properly stimulated. It will be from these stimuli that the individual learns, and learning means modifying behavior, hence the information to be processed needs to be coherent for the students (Relvas, 2012).

Neuroeducation results from the confluence of three areas of knowledge: Neurosciences; Psychology and Pedagogy. This understanding stems from the connection between neurosciences and education, and also results from the way education is structured and instituted (School), as well as from the synergies with the areas of Psychology and Psychopedagogy and is part of the current scientific paradigm in force, scientific positivism, based on the evidence that stems from the empirical character that covers the logic of scientific knowledge and discovery.

In conclusion, neuroscientific knowledge, associated with education, should be part of the initial and continuous training of teachers, and can contribute decisively to the planning of more relevant teaching methodologies, which will certainly enhance the performance of teachers and student learning. History is on the side of the new discipline *Mind, Brain and Education (MBE*), a project that began at Harvard almost 30 years ago, but there is still much important work to be done to make neuroscientific discoveries accessible, understandable and relevant to educators (Ferrari, & McBride, 2011).

In childhood, an important period of our ontogenesis, many learnings take place, we also witness the extreme dependence of caregivers. Sensorimotor activity is also visible; coordination; general motor skills; walk; run; jump and also occurs, language learning; intense social interaction, namely between parents and children or other guardians. According to the WHO (2021), the 1st childhood that is between birth and 2 years of age; and the 2nd childhood, which extends significantly until the entry of puberty, is markedly specific with regard to autonomy, with the child spending a lot of time playing alone and with peers. It is also in this period that more complex language and reading skills begin.

In turn, intermediate childhood extends from kindergarten to pre-adolescence, around 10 – 11 years old. At this stage, significant academic learning takes place, as children become more connected to activities and fundamental skills in reading, writing and arithmetic. There is also self-regulation of behaviors.

Biologically, the child is determined by programs and trends, together *Nurture versus Nature,* are the influencing factors that mark the child and in which all possible combinations of different factors will converge (Arievitch, 2017). Corroborating these ideas, Galvan (2017) considers that some changes are driven by genes or physiology, others driven by the environment. We have, therefore, a period of biological interaction and the environment, that is: it is an epigenetic process.

The high brain plasticity in childhood ensures that the stimuli received can generate the formation of new synapses, creating a solid basis for the acquisition of more complex future skills. This is because knowledge about the impact of stimuli on early and second childhood is essential for the teacher to be able to think about pedagogical activities, in order to promote a wide range of alternative learning activities that are meaningful for children (Erlauder, 2005; L'Ecuyer, 2016).

> It is indeed essential to understand the relationships between children's functioning, brain development, environment, stimuli, memories and learning during childhood. Research conducted in the tradition of Vygotsky emphasizes the idea of the zone of proximal development (ZPD), focusing on children's interaction with adults and peers, in a broad sociocultural context and various educational environments (Arievitch, 2017).

Although it is notorious for the child how easily he learns various *skills*, for example, in language, it is known that he has a significant increase in vocabulary lexicon; in the acquisition of another language; in the performance of algebraic operations, and his concentration levels are not very stable. Here too, neurosciences inform us that there are more favorable moments in the teaching/learning of most cognitive processes, those time windows in which the occurrence of certain types of experiences has greater resonance. So, given this reality, teachers at this level of education should choose to dose the tasks, since the children's attention/concentration capacity is very reduced. It is therefore advisable that the tasks be diverse, motivating, playful and mediated with breaks to play, socialize, do sports, etc.

Only at 4-5 years of age, children begin to realize that what they think is different from what other people think, as proposed in the theory of mind (Meltzoff, 1999; Meltzoff, & Decetty, 2003).

Zabalza (2018, p. 10), considers that one of the most significant contributions from neurosciences lies in the elucidation of how the brain "configures itself, how it works, how the processes of reception, storage, conservation and retrieval of the information it receives are produced within it".

According to (Machado, 2004), the brain is developed in a process of interaction, in which genetic inheritance and the environment will determine this organ, in structural and functional terms, within cognitive and socio-emotional abilities. Children learn various skills at great speed because their brain is endowed with enormous neural plasticity, according to Gazzaniga, Irvy and Mangun (2010). The evolution of working memory, the effectiveness of abstract reasoning and the improvement of attention span are important aspects that stand out in the improvement of cognitive functions. This effective improvement is also associated with cognitive functions, changes in hypothetical-deductive thinking, exploratory attitude, power of concentration, critical capacity and constant search for challenges.

PARTICULARITIES OF THE ADOLESCENT BRAIN

Neuroplasticity in the adolescent brain means that neurons have the potential to modify their structure, through the process called dendritic arborization and axonal branching, that is: there is less efficiency of information through synapses. According to Eagleman (2017), the secret lies in the way cells are connected. This is essential for the development of young people. According to this researcher, the scheme of connections is not pre-programmed, genes are important, they give very generic information, but it is the experiences during ontogenesis that adjust the rest of the connections, in order to allow the brains of young people in critical stages of their formation to adapt as best as possible. The problem of adolescent brain development consists of the readjustment of brain connections, and in this case, the educational process is essential in its regulation. On the other hand, only by understanding the activity of the amygdala in the interaction with the prefrontal lobe, can we understand the impulsive behaviors of adolescents, who often misinterpret socio-emotional signals, thus participating in risky behaviors, acting impulsively without reflecting on the possible consequences of their behaviors.

Some researchers (e.g. Spear, 2020; Steinberg, 2004), consider that during adolescence and until about 24 years of age, there is not full coordination between thoughts and emotions, which implies that in adolescence, the best decisions are not always made: this is identifiable in risk behaviors, translated into accidents, involvement in fights, less investment in school, risky diets to lose weight. In adolescence, there is also the emergence of the most abstract form of thinking: formal thinking; sometimes further aggravating the

resolution of certain situations. These facts can be explained by the profound physical changes induced by the hormonal process, by the maturation of the prefrontal cortex, as well as other cortical structures, which occur in the period of adolescence.

Researcher Esther Thelen, author of dynamical systems theory, considers that the adolescent brain is an open, dynamic and complex system, just like developing organisms, which are complex systems, with many individual elements embedded and open to a complex environment, which can imply changes in behaviors (Smith, & Thelen, 2003). Applied to brain development (complex system), this coherent theory suggests that the brain is composed of individual regions, which may work together in order to produce *outputs*. In addition, in these regions (complex system), they develop through a dynamic process with self-organization, in which changes occur after repeated experiences. In this sense, brain development occurs as an unfolding of normative development, informed by a genetic matrix, as in the case of puberty and resulting from the brain's response to the environment.

In summary, brain development can be favored if it finds conditions in the environment that provide active and meaningful experiences for the subject in his or her developmental path. For this to happen, it is crucial that educators are aware of the dynamics of brain functioning, which allows the teaching-learning process to have quality.

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SEVEN publicações acadêmicas

CHAPTER 13

THE GOLDEN MATERIAL AND THE TEACHING OF ADDITION AND SUBTRACTION: A REFLECTION FROM TEXTBOOKS

https://doi.org/10.56238/sevened2024.033-013

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ABSTRACT

Recognized by teachers who teach Mathematics and by theorists who study the use of manipulable materials in the teaching and learning processes related to this area of knowledge in Basic Education, the Golden Material represents an important pedagogical resource. Based on this understanding, we sought to answer the following question: How do the books made available by the 2019 National Textbook Program (PNLD) address the use of Golden Material as a pedagogical resource in the teaching and learning processes of the concept of addition and subtraction in the First Year of Elementary School? To this end, a bibliographic research was carried out, having as the object of the study 12 (twelve) textbooks selected by the PNLD 2019 and as a data collection instrument a form, which made it possible to identify elements related to the theme of this study in the analyzed works. With the development of this research it was possible to verify that not all the textbooks analyzed bring the Golden Material as a resource proposal for the teaching of addition and subtraction, but this does not mean that these works do not consider the use of manipulable materials relevant in this process, since other materials are indicated.

Keywords: Golden Material. Addition. Subtraction. First Year.

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INTRODUCTION

We know that the teaching of Mathematics faces numerous challenges in relation to the different realities found in schools, where we are often faced with highly structured schools, various equipment for the use of students, technology in abundance. In others, without any resources, there is a lack of professionals, students crammed into the classroom and in extreme cases even without electricity. In this way, we need to value education as a whole and provide our best to the student, motivating him to fight for his principles, showing the usefulness of Mathematics in its most diverse forms.

The Golden Material is a versatile resource that can be used in the Teaching of Mathematics, in proposals that address various concepts, ranging from the understanding of the number/quantity relationship to the abstraction of geometric concepts.

This material was created by Maria Montessori (1870-1952), graduated in medicine and in charge of the care of children with disabilities, she found that they learn more by action than by thought, which led her to develop a method and several materials aimed at the teaching and learning processes. At the age of 28, Maria visited a hospice in Rome and watched in horror as the little ones were treated in an absolutely inhumane way. She, at this moment, thought and developed this method so that she could work with these children and they would learn in the way that they best adapted.

In her successful experiments, she concluded that the Montessori method could be successful with so-called normal children, so Lubienska de Lenval, a follower of Montessori, made some modifications to the initial material and built it in wood in the form we find it in today. The name "Golden Material" comes from the original "Golden Bead Material", in analogy to beads, as the material has grooves in the form of squares.

Analyzing the teaching methods of the time, Maria Montessori proposed changes combined with her philosophy of education, with more freedom than in traditional education, where children end up memorizing the algorithms from tiring training, but without being able to understand what they do, she proposed that children use the teaching materials, including the Golden Material. In concrete experiences, the ease, comprehension and understanding of abstract numerical relations were verified. In this way, learning becomes much more enjoyable and it is verified that in addition to the understanding of the algorithms, a remarkable development of reasoning is obtained.

Among the materials used in the making of the Golden Material are wood or EVA, consisting of a large cube, ten plates, one hundred bars and one thousand smaller cubes, corresponding to the thousand, the hundred, the ten and the unit, respectively.

Another possibility of application of the Golden Material in the teaching of Mathematics is that which is intended for activities that assist in the teaching and learning processes of the decimal numbering system, in addition to representing a method to carry out fundamental operations, such as addition and subtraction.

Addition is linked to situations that involve gathering, joining, or adding. Using the concrete materials, the child has a better understanding and, in this way, the child will develop his independence, confidence in himself, concentration, coordination and order, therefore, he will work with the senses.

In this sense, a study was proposed that aims to answer the following research problem:

How do the books made available by the National Textbook Program (PNLD) two thousand and nineteen indicate the use of Golden Material as a pedagogical resource in the teaching and learning processes of the concept of addition and subtraction in the first year of Elementary School?

In order to answer this question, the objectives that guided this study were elaborated, presented below:

General objective:

Verify whether the books made available by the National Textbook Program, proposed in 2019 (two thousand and nineteen), indicate the use of Golden Material for teaching addition and subtraction for the first year of Elementary School.

With the specific objectives of studying the origin of the Golden Material and with this verify the approach that is given to this theme in textbooks, after this it will be analyzed the approach given to the concepts of addition and subtraction in the first year of Elementary School in official documents such as the National Common Curricular Base - BNCC and Gaucho Curriculum Reference - RC and also to know the National Textbook Program and its role in the availability of didactic material for the first years of Elementary School.

From this study, it is intended to contribute to the educational process of mathematics in a constructive and meaningful way, through observations of the real world and with representations using manipulated materials. Initially, the origin of the Golden Material is exposed, then the addition and subtraction in the first year of Elementary School according to the BNCC, Gaucho Curriculum Reference is presented, and we will also use the PNLD to know how the choice of books works and if each teacher takes into account the use of concrete materials for the teaching of mathematics, in this case the use of the Golden Material.

THE CONSTRUCTION OF THE GOLDEN MATERIAL

Although the current official documents indicate that from Early Childhood Education practices aimed at teaching Mathematics are carried out, in the first year several students have difficulties in understanding the basic algorithms, as well as the idea of classifying numbers according to their order or class. One of the alternatives that teachers can use so that this student does not have fear or difficulty would be to work with concrete materials, such as the Golden Material, which allows us to develop several areas and in this case addition and subtraction.

The Golden Material (Figure 1) is a resource initially produced in wood, composed of a smaller cube, with an edge measuring 1 centimeter, a bar, composed of ten of this smaller cube, a plate, 10 centimeters long, 10 centimeters wide and 1 centimeter high, and a larger cube, with an edge measuring 10 centimeters, which can also be found currently produced in EVA (Figure 2).

In this material, the smaller cube represents the unit, the bar, composed of 10 (ten) smaller cubes represents the ten, the plate, composed of 100 (one hundred) cubes, represents the hundred, and the largest cube, composed of 1000 (one thousand) smaller cubes, represents the unit of thousand.

Figura 01: Material Dourado em Madeira

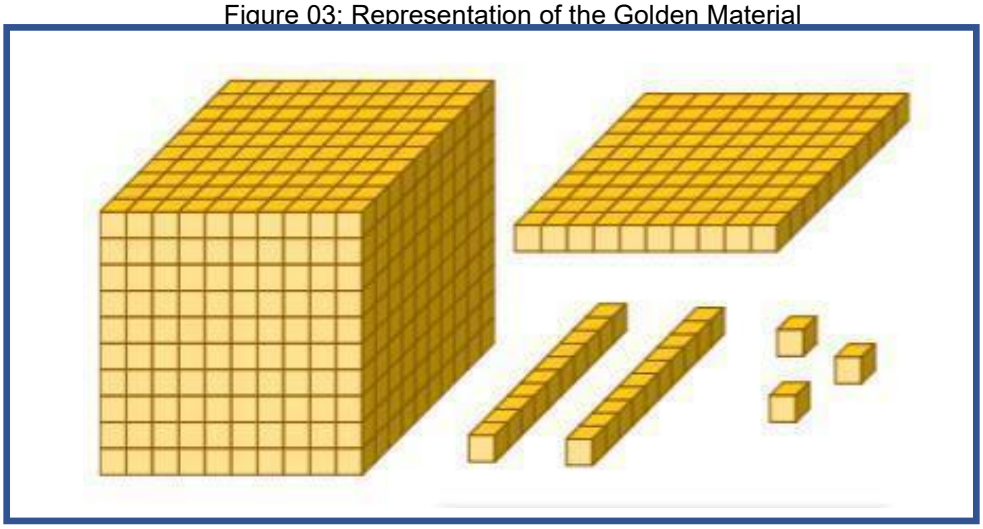
Fonte: Internet

Figura 02: Material Dourado em E.V.A

Fonte: Internet

In printed materials, such as articles and textbooks, the Golden Material is often represented by engravings, as shown in the figure below:

Figure 03: Representation of the Golden Material



Source: Internet

The Golden Material is an important device for the teaching of mathematics. With it it is possible to start various content that involves the decimal numbering system and its basic operations, but also problem solving is an effective method that can be used to develop reasoning, and also to motivate students to study mathematics. However, our schools have very different realities, both municipal and state schools are known that it is not always possible to acquire a Golden Material kit per student and sometimes even one per school.

So, with this situation, there is the opportunity to encourage students to build their own Golden Material using materials such as EVA, paper or wood and at this time involve parents in the construction, thus stimulating family interaction and their participation with the school community.

As Freitas said:

> For Montessori, manipulative material is an integral part of the learning process. In the environment imagined by her, the material is present in the classroom, which is prepared in such a way that the child has freedom and is motivated to handle it spontaneously. According to her, "the most important thing is not the teaching, but the objects: and, since it is the child who uses them, the active entity is not the teacher, but the child" (FREITAS, 2004 apud Fabio S. B.).

In traditional education, children end up learning algorithms from various trainings, and repetitions, even so, they often do not understand what they are doing. With the use of concrete material, he develops, and also better understands what he is learning. Currently, there are already several materials for manipulation in the teaching and learning of mathematics that use more recent proposals. From this, the teacher can use the industrialized form or exercise production by the students.

With the Golden Material, the student has a concrete image, facilitating the understanding of the algorithms, a remarkable development of reasoning and a much more

pleasant learning, thus facilitating the teaching of addition and subtraction. In the teaching-learning process, games can be considered motivating and formative instruments, also contributing to the development of intelligence.

The student's first contact with the material must occur in a playful way so that he can explore it freely, play, create games and shapes, it is at this moment that the child realizes the construction and the types of material used. The first activities to be proposed with the Golden Material aim to make the student perceive the relationships between the pieces and understand the exchanges in the addition and subtraction system.

With the use of concrete material in mathematics classes, we show that the student tends to absorb the proposed content more easily, in this way the teacher will provide the student with a more dynamic and different class without monotony, making a class fun, which will awaken the creativity and reasoning of the students, because they will learn mathematics having fun.

There is no intention here to place the Golden Material as the only resource to work in the classroom to teach addition and subtraction, as it is known the importance of the approach based on various resources and methodologies, as well as the long path that will have to be traveled by students to carry out operations and learn algorithms and solve problems.

The teaching of Mathematics is highly criticized for the low performance of students in the Early Years of Elementary School, by several evaluations made outside the classroom, such as the Provinha Brasil, and the Program for International Student Assessment (PISA).

Mathematics classes always have a highlight in the discussions of which methodologies should be used for teaching. In the texts we have a highlight that Carvalho emphasizes "the Teacher who proposes to work with Mathematics in the Teaching Qualification courses must reflect on this situation.". Knowledge is the result of a process of imagination, of working in a constructive and meaningful way through observations of the real world.

The didactic resources aim to promote learning more efficiently, serving as a support for the teaching of mathematics. In the teaching-learning process, games can be considered motivating instruments, also contributing to the development of intelligence.

In the state of Mato Grosso in the city of Dourados, an extension project entitled "Possibilities of teaching Mathematics with the use of didactic materials in the Public Schools of Dourados" was developed, this project intends to take the student out of the classroom and work with them in reverse shift, it was decided to work with manipulable

material because it was understood that these are instruments capable of providing a mediating approach. In these classes, addition and subtraction were worked, first the Golden Material was presented, showing it and letting the children manipulate it, then in groups conversations were held to see how much the students knew about this material.

Maria Montessori created the Golden Material to develop in children independence, self-confidence, concentration, coordination and order and with this develop experiences for a good school development. In the materials studied, Santos, Oliveira and Oliveira (2015, p. 311) highlight that: "(...) the more the child explores the world, the more he is able to relate facts and ideas, being able to think and understand". So when working with the concrete material in this case, the Golden Material it is important to allow children to play with the material, without the obligation to only use it to calculate, that the child observes what the material is made of, what its shape is, after all this explain the values of the pieces, showing each one.

With the practice carried out in this school, it was noticed that after the work with the Golden Material there was a great development of the students. Games with rules are considered by Piaget (1978) as an indispensable tool for this process. Through contact with the other, the child will internalize basic concepts of coexistence.

The objective of Mathematics classes is to offer students didactic and concrete materials that contribute to the understanding of the concepts studied, in the acquisition of knowledge, which is the result of the process of imagination, thus forming judgments, errors and successes.

PNLD AND ELEMENTARY SCHOOL BOOKS

The National Book and Didactic Material Program (PNLD) is intended to evaluate and select didactic, pedagogical and literary works, among other materials to support educational practice, in an orderly, regular and free manner, to public schools of basic education of the federal, state, municipal and district networks and to community early childhood education institutions, confessional or philanthropic non-profit and agreed with the Government.

The materials distributed by the Ministry of Education – MEC, to the public schools of basic education in the country are chosen by the schools themselves, as long as they are registered in the PNLD and also approved in some pedagogical evaluations coordinated by the Ministry of Education and which have the participation of specific technical commissions, made up of specialists from the different areas of knowledge corresponding, whose validity corresponds to the cycle to which the evaluation process refers.

After evaluation and selection by the MEC, the selected materials are made available to teachers so that they can choose the book that will be adopted the following year, evaluating whether it includes what is necessary to be worked on in the classroom.

The distribution of the books is done through a contract between the National Fund for the Development of Education (FNDE) and the Brazilian Post and Telegraph Company (ECT), which takes the books directly from the publisher to the schools. This stage of the PNLD is monitored by technicians from the FNDE and the State Secretariats of Education. The books arrive at schools approximately in October of the year prior to the service and the beginning of the school year. In rural areas, the works are delivered to the headquarters of the city halls or municipal departments of education, which must deliver the books.

The National Textbook Program (PNLD) is the oldest of the programs aimed at distributing didactic works to students in the Brazilian public school system and began, under another name, in 1937. Over these 80 years, the program has been perfected and has had different names and forms of execution. Currently, the PNLD is aimed at Brazilian basic education, with the only exception being early childhood education students.

In 1937, Decree-Law No. 93, of December 21, 1937, created the National Book Institute, the first name of the program. But in 1966, an agreement between the Ministry of Education (MEC) and the U.S. Agency for International Development (USAID) allowed the creation of the Technical Book and Textbook Commission (COLTED), with the objective of coordinating actions related to the production, editing, and distribution of textbooks. The agreement ensured the MEC sufficient resources for the free distribution of 51 million books over a period of three years. By guaranteeing government funding from public funds, the program acquired continuity.

In 1983, replacing the National Foundation for School Supplies (FENAME), the Student Assistance Foundation (FAE) was created, which incorporated the Textbook Program for Elementary Education (PLIDEF). On the occasion, the working group in charge of examining the problems related to textbooks proposes the participation of teachers in the choice of books and the expansion of the program, with the inclusion of the other grades of elementary school.

In 1985, with the enactment of Decree No. 91,542, of 8/19/85, PLIDEF gave way to the National Textbook Program (PNLD), which brought several changes, such as: indication of the textbook by teachers; reuse of the book, implying the abolition of the disposable book and the improvement of the technical specifications for its production, aiming at greater durability and enabling the implementation of textbook banks; extension of the offer to 1st and 2nd grade students in public and community schools; end of the financial participation

of the states, passing control of the decision-making process to the FAE and guaranteeing the criterion for choosing the book by teachers.

An important advance in the textbook programs occurred in 2012, when a public notice was published for the formation of partnerships for the structuring and operation of a public and free service to make digital materials available to users of national education.

For the 2015 school year, the public notice launched now provides for publishers to present multimedia works, bringing together printed books and digital books, and the digital version must bring the same content of the printed material in addition to digital educational objects, such as videos, animations, simulators, images, games, texts, among other items to assist in learning. This public notice also allowed the presentation of works only in the printed version, to enable the participation of publishers that have not yet mastered the new technologies. This material was intended for students and teachers of public elementary school.

The PNLD 2019 Notice, on the other hand, establishes that the selected collections must make available to the student the printed textbook (including in Braille) and the class regent must be offered the Teacher's Manual, consisting of a printed book and digital material. The works intended for the Initial Years of Elementary School will have a four-year cycle, and the replacement of these materials may be requested annually throughout this period.

The materials selected by the PNLD 2019 had to meet some indications proposed by its notice, some of which are:

> [...]2.2.4 The works will consist of the printed student book and in Braille and the teacher's manual, the latter consisting of a printed book and digital material, with the exception of the following:
> a) Physical Education Discipline, which will have only the printed teacher's manual;
> b) Integrative Projects, which will have a printed student book and teacher's manual. (BRASIL, 2017b, p. 03).

In this sense, it should be noted that, since its notice, the PNLD 2019 proposes that books in Braille be made available to students, and the Manual to teachers, both printed and in digital format, except for the subject component Physical Education.

With regard to the Teacher's Manual, the PNLD 2019 notice defines that:

> The teacher's manual, in its various components, should guide the teacher's work in the classroom, supporting him from the processes of planning, organization and sequencing of contents and activities to be carried out to the monitoring and evaluation of student learning, and, above all, should play a significant role in proposing innovative, stimulating and effective practices to the teaching-learning process (Brasil, 2017b, p. 37).

Therefore, the Teacher's Manual will enable this professional to organize their planning, from classroom activities to the evaluation of their students' learning, proposing innovative practices that contribute significantly to the teaching-learning process.

In addition to the Teacher's Manual, the PNLD 2019 notice proposes that the Digital Material be made available to teachers, consisting of development plans (bimonthly or quarterly), didactic sequences, among others. As we read below:

> 2.2.4.1 The digital material with complementary content will consist of the following materials, specified in Annex III: Bimonthly/Quarterly Development Plans, Didactic Sequences, Learning Monitoring Proposals and Audiovisual Material.
> 2.2.4.2 The presentation of the Digital Audiovisual Material is optional and the result of its evaluation does not condition the approval of the collection.
> 2.2.4.3 Digital material with complementary content, specified in Annex III, must be made available under an open Creative Commons - Non-Commercial Attribution license (CC BY NC – 4.0 International or CC BY NC – 3.0 BR) (BRASIL, 2017b, p. 03).

Another resource, also provided for by the PNLD 2019 notice, is what is called by this document the Audiovisual Material, even if on an optional basis and whose evaluation would not interfere in the choice or not of the material analyzed.

ADDITION AND SUBTRACTION IN THE FIRST YEAR OF ELEMENTARY SCHOOL FROM THE PERSPECTIVE OF OFFICIAL DOCUMENTS.

Mathematics, as an area of knowledge, through the articulation of its various fields – Arithmetic, Algebra, Geometry, Statistics and Probability, is defined by official documents, BNCC and RCG, as the area that aims to develop in the student the ability to solve problems existing in his daily life, applying the knowledge acquired.

In this sense, the Gaucho Curriculum Framework, based on the National Common Curricular Base, recognizes as specific competencies in this area:

> 1. Recognize that Mathematics is a human science, the result of the needs and concerns of different cultures, at different historical moments, and is a living science, which contributes to solving scientific and technological problems and to support discoveries and constructions, including impacts on the world of work.
> 2. Develop logical reasoning, the spirit of investigation and the ability to produce convincing arguments, using mathematical knowledge to understand and act in the world.
> 3. Understand the relationships between concepts and procedures in the different fields of Mathematics (Arithmetic, Algebra, Geometry, Statistics and Probability) and other areas of knowledge, feeling secure about their own ability to build and apply mathematical knowledge, developing self-esteem and perseverance in the search for solutions (BRASIL, 2017, p. 267).

From the competencies presented above, it is clear that these documents bring Mathematics as the area of knowledge that was developed by man, from his experience, in

the most varied historical moments and in the most diverse cultures. And that for this reason such an area enables the individual to develop logical reasoning and the ability to argue, relating the different fields of mathematics.

The same documents, BNCC and RCG, also indicate as specific competencies to be developed in Elementary School, with regard to Mathematics,

> 4. Make systematic observations of quantitative and qualitative aspects present in social and cultural practices, in order to investigate, organize, represent and communicate relevant information, to interpret and evaluate it critically and ethically, producing convincing arguments.
> 5. Use mathematical processes and tools, including available digital technologies, to model and solve problems in everyday life, social and other areas of knowledge, validating strategies and results.
> 6. To face problem situations in multiple contexts, including imagined situations, not directly related to the practical utilitarian aspect, to express their answers and synthesize conclusions, using different registers and languages (graphs, tables, schemes, as well as text written in the mother tongue and other languages to describe algorithms, such as flowcharts, and data) (BRASIL, 2017, p. 267).

It can be identified in the official documents the indication that the Mathematics to be addressed in Elementary School, from the Early Years, should provide the child with the ability to, based on social and cultural practices, make systematic observations of qualitative and quantitative aspects, using mathematical and technological processes and tools, so that he is able to solve problem situations, using different registers and languages.

Also according to the BNCC and the RCG, the following are specific competencies of Mathematics:

> 7. Develop and/or discuss projects that address, above all, issues of social urgency, based on ethical, democratic, sustainable and solidary principles, valuing the diversity of opinions of individuals and social groups, without prejudice of any kind.
> 8. Interact with their peers in a cooperative way, working collectively in the planning and development of research to answer questions and in the search for solutions to problems, in order to identify aspects that are consensual or not in the discussion of a given issue, respecting the way of thinking of colleagues and learning from them (BRASIL, 2017, p. 267).

In this way, it is possible to recognize in these documents the thought that it is also up to Mathematics, present in the curriculum of the second stage of Basic Education, to stimulate collective work, in an attempt to solve problems common to society and the ability to reflect on projects related to social urgencies, based on principles such as ethics, sustainability, appreciation of diversity and solidarity.

According to the BNCC:

> Elementary School should be committed to the development of mathematical literacy, defined as the competencies and skills of reasoning, representing,

> communicating and arguing mathematically, in order to favor the establishment of conjectures, the formulation and the resolution of problems in a variety of contexts, using concepts, procedures, facts and mathematical tools. It is also mathematical literacy that ensures students recognize that mathematical knowledge is fundamental for understanding and acting in the world and perceive the intellectual game character of mathematics, as an aspect that favors the development of logical and critical reasoning, stimulates investigation and can be pleasurable (fruition) (BRASIL, 2017, p. 265).

Therefore, it is considered that from the Early Years of Elementary School, with the development of mathematical literacy, the development of skills such as reasoning, arguing, formulating and solving problems should be stimulated in the child, because in this way it becomes possible to ensure that students have the ability to recognize that mathematical knowledge enables understanding and acting in the world.

In order to promote the development of such skills, to "ensure the right to learn mathematical knowledge considered essential for integral human formation and, also, with the objective of guiding schools in the organization of their Political-Pedagogical Proposal" (Rio Grande do Sul, 2018, p. 49-51), the official documents structured the Mathematics curriculum based on a set of skills related to the different objects of knowledge, contents, concepts and processes, organized into thematic units, called Numbers, Geometry, Algebra, Quantities and Measures and Probability and Statistics.

According to what is presented in the BNCC, the concepts of Addition and Subtraction, with regard to the First Year of Elementary School, are located in the thematic unidate "Numbers", based on the objects of knowledge "Construction of basic facts of addition" and "Problems involving different meanings of addition and subtraction (join, add, separate, remove)". The following skills are proposed to be developed, respectively:

> (EF01MA06) Build basic facts from addition and use them in calculation procedures to solve problems. Composition and decomposition of natural numbers.
> (EF01MA08) Solve and elaborate addition and subtraction problems, involving numbers of up to two digits, with the meanings of joining, adding, separating and removing, with the support of images and/or manipulable material, using strategies and forms of personal recording (BRASIL, 2017, p. 279).

Thus, the BNCC recognizes the fact that the concepts of addition and subtraction, in the context of the First Year of Elementary School, should be related to problem solving, the composition and decomposition of natural numbers, involving numbers composed of up to two digits, relating the concept of addition to the meaning of "join" and "add". And the concept of subtraction can be associated with the idea of "separating" and "removing".

The Gaucho Curriculum Reference with regard to the area of Mathematics, for Elementary School, is aligned with the BNCC, reaffirming the commitment to human formation, recognizing that mathematical knowledge is necessary for all students to become

a critical citizen aware of their social responsibilities, seeking through mathematical thinking to understand the significant representations and consistent argumentations in the context of mathematics.

Mathematics, in addition to playing a formative role, as it enables the role of reasoning, also helps in the development of problem solving in the context of everyday life.

After the contribution of more than 120 thousand people and the realization of several mobilizations throughout 2018, the Gaucho Curriculum Reference was approved on the morning of December 12, 2018, by the State Council of Education (CEED) and the National Union of Municipal Councils of Education (UNCME).

The document prepared in collaboration between the State Department of Education (SEDUC), the National Union of Municipal Education Directors (UNDIME) and the Private Education Union in Rio Grande do Sul (SINEPE/RS), should be the guide for the curricula of schools in Rio Grande do Sul since 2019. The changes, which follow the guidelines of the new National Common Curriculum Base (BNCC), are valid for Early Childhood Education and Elementary School.

Still in the thematic unit "Numbers" and having as object of knowledge also the "Construction of basic facts of addition", the Gaucho Curriculum Reference – RCG brings as skills whose development must be achieved in the First Year of Elementary School:

> (EF01MA06RS-1) Explore and establish additive relationships between numbers less than 10 by applying them to solve problems in everyday situations.
> (EF01MA06RS-2) Explore and express the idea of equality by realizing that the same number can be formed by different additions (RIO GRANDE DO SUL, 2018, p. 59).

With regard to the object of knowledge identified as "Problems involving different meanings of addition and subtraction (joining, adding, separating, removing)", the same document proposes:

> (EF01MA08RS-1) Understand the different meanings of addition and subtraction (joining, adding, separating and removing) using manipulable material.
> (EF01MA08RS-2) Express, through their own strategies, the resolution of problems involving addition and subtraction and their meanings.
> (EF01MA08RS-3) Perceive and argue the differences between the operations of addition and subtraction by applying them in different situations (RIO GRANDE DO SUL, 2018, p. 60).

Based on the skills proposed to be developed in the First Year of Elementary School, according to the RCG, it is verified that the concepts of addition and subtraction need to be approached at this level of education from everyday situations, problem solving, in addition to identifying in the most varied situations the differences between addition and difference.

The National Common Curricular Base and the Gaucho Curriculum Reference present similar approaches to the teaching of Addition and Subtraction in the first year of Elementary School, signaling the importance of relating the concepts addressed in the classroom with situations of the student's daily life, in addition to stimulating the development of logical reasoning and through teaching methodologies, such as problem solving and the use of manipulable materials.

The teacher when teaching Mathematics should try to organize the teaching and learning processes, respecting the differences between students and showing them that for each problem there may be more than one form of solution, since not everyone learns in the same way, some students have a little more difficulties and others, however, have greater ability, acquiring a taste for this subject.

METHODOLOGY

Considering that the general objective of this study is "To verify whether the books made available by the National Textbook Program, proposed in 2019 (two thousand and nineteen), indicate the use of Golden Material for the teaching of addition and subtraction for the first year of Elementary School", it is considered that the research methodology that best describes the study carried out is the one based on the methodological principles of bibliographic research, according to Marconi and Lakatos (2003).

As objects of this study, 12 (twelve) of the 16 (sixteen) textbooks aimed at the First Year of Elementary School, for the discipline of Mathematics and selected by the PNLD 2019, were considered. Where the possibilities of using the Golden Material as a pedagogical resource in the teaching and learning processes of addition and subtraction at this level of education were observed. And as an instrument for data collection, a table was used, which made it possible to identify elements related to the theme of this study in the analyzed works.

Considering that in this study the characteristics of the proposals presented in the textbooks made available by the PNLD 2019 were analyzed, for the discipline of Mathematics in the First Year of Elementary School, it was decided to use the methodology of qualitative analysis, since it is "[...] a method of dynamic and totalizing interpretation of reality, since it considers that facts cannot be revealed outside a social, political, economic context, etc." (PRODANOV; FREITAS, 2013, p. 35).

RESULTS AND DISCUSSIONS

Although recognized by many researchers as an important pedagogical resource, which contributes significantly to the teaching and learning processes of some mathematical concepts, the Golden Material is still little mentioned in textbooks. With the analysis of the selected materials, it was possible to verify that 06 (six) selected books present some proposal for the implementation of this resource.

Among the proposals found are activities in which the Golden Material is indicated to be used in situations involving the composition and decomposition of natural numbers into units and tens, as shown in the figure below (Figure 3):

Figure 3 - Activity with the Golden Material

PREENCHA O QUADRO DE ACORDO COM OS EXEMPLOS.

REPRESENTAÇÃO COM MATERIAL DOURADO	D	U	DECOMPOSIÇÃO EM DEZENAS E UNIDADES E ESCRITA POR EXTENSO	NÚMERO
	1	0	1 DEZENA DEZ	10
	1	1	1 DEZENA E 1 UNIDADE ONZE	11
	1	2	1 DEZENA E 2 UNIDADES DOZE	12
	1	3	1 DEZENA E 3 UNIDADES TREZE	13
	1	4	1 DEZENA E 4 UNIDADES QUATORZE	14
	1	6	1 DEZENA E 6 UNIDADES DEZESSEIS	16
	2	0	2 DEZENAS VINTE	20

Source: Conceição, Martins, Silva and Reis (2018)

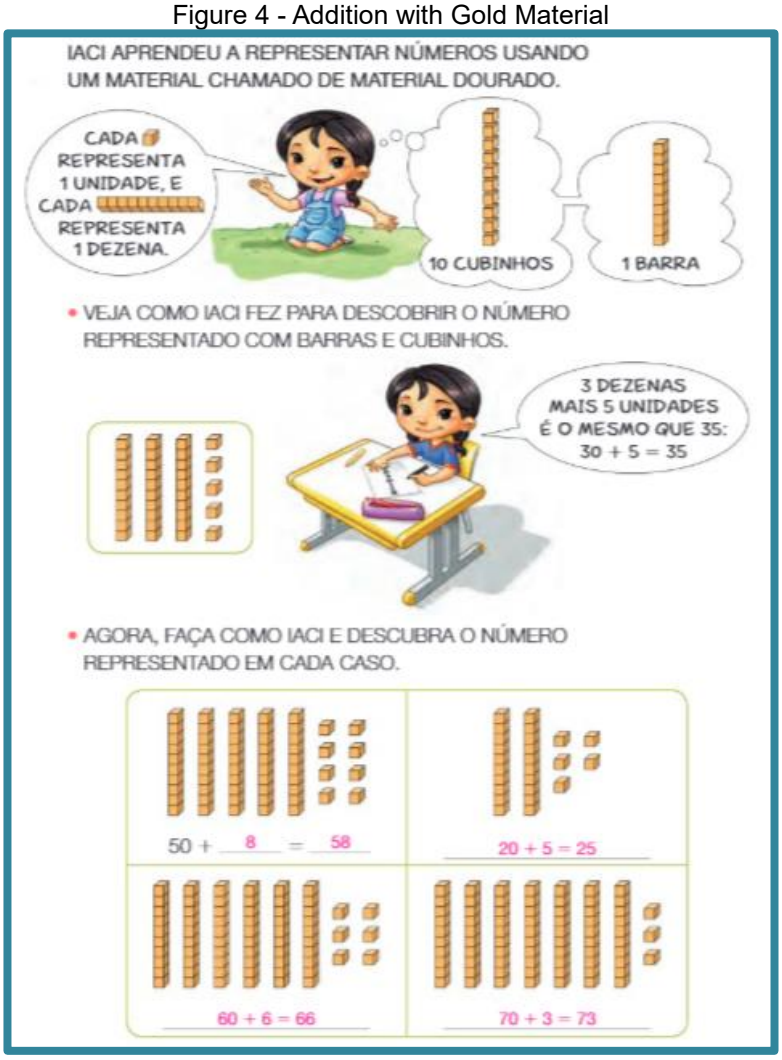
When carrying out activities involving mathematical concepts with the help of the Golden Material, the child can observe the concept from the concrete, because according to Freitas (2004, p. 65 - 66):

> [...] The Golden Material makes the processes easier to understand and accept because it is a practical and visual activity. The student can appropriate knowledge by manipulating and verifying all phases of the various construction processes, thus being able to assimilate, criticize and create new ways of organizing his thinking,

> which helps in the development of logical-mathematical reasoning. There are several operations that can be performed with this resource, all of them presuppose the previous understanding of the representations and the rules of groupings and ungroupings.

In addition to facilitating the understanding of primitive mathematical concepts, Freitas (2004) states that by manipulating the Golden Material, the child will be able to perform important empirical and reflective abstractions. Another application for the Golden Material, although represented by figures in textbooks, is the use of this resource as a way of representing the operations of addition and subtraction, as can be seen in the activity presented as an example, in the following figure.

Figure 4 - Addition with Gold Material



Source: Silveira (2017)

According to Moura and Oliveira (2020, p. 106),

> The importance of the Golden Material is made exactly in filling gaps often left aside in the initial grades. Such as the understanding of what really happens when operating with addition and subtraction, the concept of units, tens and hundreds, sums of numbers with two digits or more, among other problems that many

> educators encounter. That is why the Golden Material is important because it brings the problems of the abstract to the concrete, and vice versa. We can present the Golden Material and encourage students to represent numbers, operate and finally apply this knowledge in their daily lives as simple operations.

As for several scholars and teachers who use the Golden Material as a resource aimed at teaching mathematical concepts, such as addition and subtraction, Moura and Oliveira the authors state that, as it is a way of reproducing the abstract from concrete materials, this resource provides the filling of gaps that often originate in the Early Years of Elementary School.

FINAL CONSIDERATIONS

Currently, the textbook, as well as the Teacher's Manual, still represents an important aspect for the definition of the curriculum effectively used in classrooms, even more so when, in the midst of a pandemic like COVID19's, where teachers find themselves distant from their students.

In this sense, the study called "The use of Golden Material as a resource in the teaching of Addition and Subtraction in the First Year of Elementary School: a reflection from Textbooks" was proposed in order to verify whether the books made available by the National Textbook Program, proposed in 2019 (two thousand and nineteen), indicate the use of the Golden Material for teaching addition and subtraction for this level of education.

Based on this objective, when analyzing 12 (twelve) of the 16 (sixteen) textbooks, an integral part of the Teacher's Manual for the First Year of Elementary School and selected by the PNLD 2019, we can see that 06 (six) of these materials do not mention the Golden Material as a proposal for a pedagogical resource aimed at the teaching and learning processes of Mathematics, for this cycle of education. However, the other materials analyzed bring examples of activities related to addition, subtraction, composition and decomposition of a natural number (unit and ten) in which the Golden Material can be used.

From the readings carried out, we verified that the Golden Material represents an important pedagogical resource for the teaching of Mathematics, especially in the Early Years of Elementary School, when the child still has the need to use concrete materials to understand some concepts.

Regarding the concepts of Addition and Subtraction, to be addressed in the First Year of Elementary School, both the BNCC and the RCG reinforce the importance of approaching these concepts from the resolution of problems that represent situations of the child's daily life, in addition to the use of manipulable materials, such as the Abacus, the Golden Material, the use of calculators, games and the performance of mental calculations.

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SCHOOLING OF RURAL WORKERS: CHALLENGES AND OPPORTUNITIES FOR THE GUARANTEE OF RIGHTS TO EDUCATION

https://doi.org/10.56238/sevened2024.033-014

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ABSTRACT

Studies state that the need to work is the main reason given by young people aged 14 to 29 to drop out of school. In this way, Youth and Adult Education (EJA) is a teaching modality whose objective is to ensure the educational rights of the population that did not have access to or interrupted their studies before the end of Basic Education. The present research aims to historically understand the challenges and perspectives of rural workers' access to educational programs. First, the literature review was adopted as a method, from 2007 to 2023, on the topic of schooling of rural workers. Two rural workers enrolled in EJA also participated, through a semi-structured interview. The interviewees pointed out that fatigue was the main factor that prevented the continuity of studies, and the EJA teaching modality was beneficial for school education. Brenner and Carrano (2023) highlight that work and school are social spaces and times that, when articulated, produce expectations and make life projects viable, and work should not only be understood as a search for means of subsistence, but also as the search for independence and autonomy on the part of students. There are several challenges in reconciling study and work, raising reflections on the importance of schooling and the contributions of Psychology to the understanding of the psychological processes necessary for the formation of the subject, the educational process and the implementation of educational activities.

Keywords: Schooling of Youth and Adults. Rural Workers. Right to Education.

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INTRODUCTION

Historically, the objective of the 1934 Constitution was to improve the living conditions of the vast majority of Brazilians, creating laws on education, work, health and culture. The right of citizenship of Brazilians was expanded, enabling a large slice of the population, which until then had been marginalized from the political process in Brazil, to participate in this process. The Constitution of 1934 brought, therefore, a perspective of change in the lives of a large part of Brazilians. As a citizen's right and a duty of the State, public school education must be guaranteed through public and free access to elementary and secondary education for all those who have not completed them at the appropriate age. Article 37 recommends Youth and Adult Education (EJA), highlighting that it will be aimed at those who did not have access to or continuity of studies in elementary and secondary education, at the appropriate age. This article is updated by Law 13.632/2018, with the vision of EJA expanded to an instrument of education and lifelong learning (Brasil, 2018).

Article 205 of the Federal Constitution of 1988 also brings references that guide the notion of the right to education, ensuring that education is a right of all and also a duty of the State and the family, and should be promoted and encouraged with the collaboration of society, aiming at the full development of the person, their preparation for the exercise of Citizenship and their qualification for work (Brasil, 2016).

However, in the twentieth century, thinking about rural education, this was not a matter of concern for the State, because the interest in rural education in the country began when illiteracy began to bother the city, in which industrial development and the expansion of commerce and services took rural migrants, in a large portion, illiterate people, for urban spaces. Since then, literacy and schooling in the countryside has become a requirement of the city. For most of Brazil's history, illiteracy was present as an agricultural country, with the majority of the population living in the countryside (Ferraro, 2012).

The school in the countryside took time to be institutionalized, because until the first decades of the twentieth century it was intended only for people who had more financial conditions. The neglect of cultural matrices was demonstrated, in which the focus was only on slave labor. However, in relation to Brazilian school education, it demonstrates a precariousness in the human elements for pedagogical work, inadequate infrastructure and physical spaces, lack of working conditions, including salary, absence of initial and continuing education (Hage, 2009).

These subjects carry a tradition of illiteracy, treated as a social condition, in which men and women identify as their own and individual disabilities, removing the responsibility of the State in distinguishing financial and human resources that ensure the right to

education, also not being seen as a consequence of weaknesses in the organization of society. In a way, meeting the educational needs, the State has been offering literacy and elementary and secondary education programs for the young and adult population of the countryside who do not go to school as children and this offer promises an improvement in life and points to professional perspectives (Pereira, 2007).

Thus, the schooling of rural workers allows us to affirm that the education of young people and adults in the countryside is still carried out with precariousness. Participatory spaces such as associations, unions and, especially, councils have not been effectively incorporated into the universe of these workers to seek solutions or exercise social control over educational policies and programs. Education is treated in a secondary way as a matter of the State, leading to a discrepancy between the discourse and the practical reality, when he states that although rural workers insist on attending education courses in precarious classrooms, where the efforts of teachers from the rural communities themselves are spent so that the teaching-learning process takes place (Pereira, 2007).

Starting from another assumption, the Schooling of Youth and Adults can be a means of contact for these rural workers who do not have access to rural schooling, that is, in the countryside, since they need to go to schools in the cities. Thus, EJA is a teaching modality aimed at guaranteeing the educational rights of this large population that did not have access to or interrupted studies before completing Basic Education. It is a practice in which adults engage in systematic and sustained self-education activities in order to obtain newforms of knowledge, skills, attitudes, and values (Oliveira, 1999).

EJA has been offered since 1970 to young people and adults from 15 years old and is divided into two segments: for the initial and final grades. Thus, the first segment has reading as an educational principle as a methodology, being aimed at literacy, with a pedagogical teacher as responsible (Reibnitz; Melo, 2021).

The EJA system was created to ensure the development of basic education for people over school age. People who enroll in EJA are looking for a different course. Most work, have families or other responsibilities that prevent them from devoting much of their time to school. Usually, class time is the only time they have to study. Consequently, youth and adult education must be designed to adapt to the needs and limitations of this public. Moreover, the tasks that teachers face are not only methodological in nature. Although the contents supplied are the same as those aimed at those who attend education at the appropriate age, the teaching practices cannot be the same, because it is an audience with a lot of cultural baggage and life experience. They are grouped into two very distinct profiles, adolescents and adults, in the same class (Ciampi, 2003).

However, young people from the popular classes face a hard and unprotected struggle that combines work and permanence in school, and it must be said that in this context of growing uncertainties and diminishing margins of predictability for the future, young people who still give up school, but who want jobs protected, not only by the formal contract, but also that it is a fixed job that allows them enough remuneration and free time to reconcile so many tasks (Brenner; Carrano, 2023).

The return to schooling can represent for these young people a unique moment of resumption of the senses, feeding dreams and future projections, as the experience lived in other spaces makes it possible to understand the importance of school. When many of these young people experience obstacles caused by the absence of school credentials, whether in the labor market or social life, the interruption of studies is reviewed and re-entry becomes the alternative (Brenner; Carrano, 2023).

Studies state that the need to work is the main reason given by young people aged 14 to 29 to drop out of school, according to a survey by the Brazilian Institute of Geography and Statistics (IBGE). Approximately four out of ten young people who did not complete high school had to leave the classroom to work. The IBGE states that in all, in Brazil, 20.2% of young people between 14 and 29 years old did not complete high school, either because they dropped out of school before the end of this stage, or because they never attended it. This is equivalent to 10.1 million young people. The majority are men (58.3%) and blacks or browns represent 71.7% of all those who were not studying. According to the survey, when asked about the main reason for having dropped out or never attended school, these young people pointed out the need to work as a priority factor, an answer given by 39.1% of the interviewees (IBGE, 2013).

In this way, the role of schools is to form conscious citizens who understand the functioning of the society in which they live and find ways to improve it. Therefore, schools should not only teach students the importance of rules and laws for social coexistence and respect for the rights of others, but also help to build a fairer society, providing students with the tools to assert their rights (Bondioli, 2008).

It is also the school's function to contribute to the integral formation of the student in the most different formative areas: social, academic and professional, helping him to face the challenges of life. Socio-emotional skills are important to form responsible and empathetic adults, who respect others and know how to manage their own emotions (Penteado, 2023). The school, by contributing to the formation of critical thinking, promotes the development of social and emotional skills that are important for coexistence inside and

outside the educational environment, also contributing to the formation of more ethical citizens, who actively contribute to social well-being (Savio, 2013).

Thus, the objectives of this article are to historically understand the challenges and perspectives of rural workers' access to educational programs, to carry out a bibliographic survey on the schooling of rural workers, to conduct interviews with rural workers participating in educational programs for the schooling of young people and adults, as well as to highlight the contributions of Psychology to the education of rural workers, from the organization of educational programs.

MATERIALS AND METHOD

The present study was submitted to the Human Ethics Committee and received a favorable opinion, under CAAE number 69167923.1.0000.5496. First, the literature review was adopted as a method, from 2007 to 2023, on the topic of schooling of rural workers. The search for the texts was carried out in the BvsPsi, SciELO and Google Scholar databases, based on the keywords: youth and adult education, rural workers, right to education, education in the countryside, schooling of rural workers. A total of 21 articles were found, but after reading, nine were selected, as they are closer to the theme proposed in this study. Bardin's (2011) Content Analysis was used, and the following categories of analysis were established: Youth and Adult Education, Work and Schooling, Future Perspectives, which will be discussed below.

In a second moment, two 35-year-old rural workers who attended EJA in an educational institution in the interior of the State of São Paulo participated in a semi-structured interview. The participants signed the Informed Consent Form. The qualitative approach was carried out through an interview, composed of 16 questions, about the participant's personal data, what motivated them to return to the study, how this process was, the difficulties encountered and the reasons for not continuing the studies at the initial moment of entry into the educational system.

RESULTS AND DISCUSSION

As discussed in the methodology, nine articles were selected, two from 2007, one from 2015, two from 2021, one from 2022 and three articles from 2023, as shown in Table 01.

Table 01 - Articles selected from scientific databases

No.	Year	Title	Author	Local	Type of study	Outline	Objective
1	2007	Spaces for participation and schooling of rural workers: construction or destitution of the right to education in the countryside?	Pereira, Sônia Barreto	Baturity, CE	Research review and analysis study	Qualitative analysis	To identify the explanatory factors for the persistence of this population in educational processes marked by difficulties and insufficiencies, examining to what extent the right to education has been instituted in the countryside.
2	2007	Truncated trajectories, work and future: outstanding young people in public high school.	Pereira, Sônia Barreto	Rio de Janeiro, RJ	Statistical review study	Quantitative analysis	To understand and understand schooling trajectories and biographical paths of young high school students from public schools who are in a situation of school discrepancy.
3	2015	The training of young people from the countryside and the link between knowledge, work and education: a study of the Colégio Estadual do Campo Iraci Salete Strozak.	Janata, Natacha Eugenia	Rio de Janeiro, RJ	Statistical review study	Quantitative analysis	To highlight the problems about access to knowledge and the relationship between work and education in the training of young people.
4	2021	Research as an educational principle: a work methodology for Youth and Adult Education.	Reibnitz, Cecília de Sousa; Melo, Ana Carolina Staub de	Florianópolis, SC	Review study	Qualitative analysis	To analyze this methodology, adopted by the network since 2001, going through its development, its theoretical references and some reflections on daily school practice.
5	2021	Juvenilization of EJA and the implications in the schooling process.	Souza Filho, Alcides Alves de; Cassol, Atenuza Pires; Amorim, Antonio	Salvador, na Bahia	Review study	Quantitative analysis	Reflect on the reasons that determined the insertion of young people in EJA, specifying the causes and impacts experienced.
6	2022	Proeja students: from denied paths to other possibilities.	Gomes, Maria de Fátima Feitosa Amorim; Freitas, Marinaide Lima de Queiroz; Marinho, Paulo	Alagoas, AL	Review study Experience analysis	Quali-quantitative analysis	To know and understand the demographic, socioeconomic and educational profiles of students of the National Program for the Integration of Professional Education with Basic Education in the Youth and Adult Education Modality (Proeja).
7	2023	Popular education in public schools: an analysis of the origins of the Youth	Serra, Enio.	Rio de Janeiro, RJ	Review Review	Qualitative analysis	To reflect on the historical perspective of Popular Education in Youth and Adult Education in public schools.

		and Adult Education Program of the municipal network of Rio de Janeiro (1985-1996).					
8	2023	Between Work and School: life courses of poor young people.	Brenner, Ana Karina; Carrano, Paulo Cesar Rodrigues	Rio de Janeiro, RJ	Review Review	Qualitative analysis	To analyze the data that are the result of three research methodologies: survey, narrative interviews and photographic devices for the narration of oneself.
9	2023	Work trajectories: precarious jobs and temporary insertions.	Silva, José Humberto da	Salvador, BA	Review Review	Qualitative analysis	To unveil the work paths built by part of the Brazilian working youth, this work intends, through singular trajectories and triangulating together with national databases, to analyze two forms of insertion in work: the first job through the apprenticeship law and the job in the telemarketing sector.

Source: Prepared by the authors (2023).

In the first category, Youth and Adult Education (EJA), we perceive it to be a teaching modality aimed at serving a portion of the population, represented by young people and adults, who are workers and who seek insertion in the teaching-learning process, because they are not able to study at the expected age. Serra (2023) states that the difficulties of implementing EJA pedagogical projects in public schools may originate from the supposed dichotomy between formal and non-formal education, in which despite important advances in some contexts, the difficulties in developing EJA, from the perspective of Popular Education in public schools, continue to be many.

Starting from another assumption, despite the great difficulties encountered, in some regions of Brazil, such as Florianópolis-SC, a different methodology called research as an educational principle was implemented, in which the focus of the classes is to develop research by the students, with the teachers acting as mediators and proposing interventions for the class. This methodology emerged through the perception of the great demand for EJA as opposed to a small portion of the population it reaches, aiming to be as diverse as possible (Reibnitz; Melo, 2021).

In the second category, which comprises Work and School, it is possible to understand that when analyzing the conformation of the labor market at the end of the first decade, a drop in the unemployment rate can be perceived. According to Silva (2023), the labor market does not homogeneously affect all youth, nor the Brazilian working youth, in

which geographic territory, social class, sex, color/race are factors that lead to this inequality.

However, it is not uncommon for these same young people to be held responsible for their choices made in frameworks that combine structural inequalities, economic crises, and social and cultural restrictions inherited by the cycle of family poverty (Brenner; Carrano, 2023), and in the face of this biographical model, young people in a risk society need to be active subjects in the construction of biographies in productive conditions for the realization of their choices (Beck, 2010 apud Brenner; Carrano, 2023). It is understood that associating work and education brings formative elements to the understanding of the historical form that we live under human alienation (Freitas, 2011 apud Janata 2015).

In the third category, Future Perspectives, Panno and Machado (2014) argue that through their decisions, individuals aim to pursue their pre-established goals, as well as to have pleasant working conditions. Although the incentives given to their permanence in rural areas are increasing, they are still unattractive in the midst of the opportunities offered outside it, for example by urban areas. Schooling brings the prospect of an improvement in income, social ascension, professional recognition and the conquest of an increasingly competitive space in the labor market (Panno; Machado, 2014).

During the interviews, the participants reported the difficulty of reconciling work in the field and studies, since the demand for service was exhausting to the point of giving up their desire to complete schooling, resulting in the abandonment of school for an indefinite period. In relation to these statements, Carrano, Marinho, Oliveira (2015), present that many of the social and individual characteristics have acquired meaning in the relationship with the existential challenges in the social context that surrounds the individual, and the case of young people out of the enrolled grade can be cited, reconciling the dual condition of student and worker, being a decisive factor in the challenge of schooling. The authors point out that this challenge can be aggravated by the reality of schools that seem to ignore that part of their students are already workers or are looking for work.

It is noticed that some questions related to returning to studies after a period refer to the search for a better job, as they would only be able to achieve this goal when they finish their studies. However, EJA is one of the only resources that they could use. Therefore, the interviewees refer to EJA as an important factor in their lives.

However, there is a great demand for EJA in the country, in contrast to the small population that this modality reaches, making it difficult to meet the needs of the population, which are diversified and it would not be possible to imagine the application of a formula on

a large scale. Its function is to repair the paths not taken in the regular time of elementary and high school (Reibnitz; Melo, 2021).

In the history of EJA, the focus of this modality is configured as a reparative action, of the right to equitable and quality education, along with the updating of learning. It is understood that this specific audience comes in search of literacy and schooling in an age group that marks the identification of this group of students (Filho; Cassol; Amorim, 2021). Thus, the impossibility of choice during childhood refers to the alternative of opting for hard work, but which for a period of time makes sense in the subject's life. As we can see in the interviews carried out with two employees who attended high school, through EJA.

Interviewee 01 says that he is 35 years old and single, he states that he has been married for a few years, but that he has never had children and currently lives with his father and aunt. He states that he does not perform a function only at work, because in addition to working driving a sugarcane harvester, he also works driving tractors and other agricultural machinery. These other functions are performed when some workers are off duty or for some reason, the workers needed to be absent from work. The employee says that he had already attended school before, but that for reasons of work and fatigue he had to stop his studies. He states that he worked in the fields with his father, and that the work was heavy and very tiring, to the point that he had no strength or desire to go to school at night. Fomenta who stopped in the 2nd year of high school, then he says that his motivation and desire to return to his studies was specifically to have a vision of the future, such as taking public exams or even attending college.

The interviewee points out that for a long time he had the desire to continue his studies, but that because he worked in new positions and that each week he was in different shifts, this could be jeopardized if he started studying again. She said that initially she did not go back to school, even with the desire, because her routine was still confusing and she first needed to organize herself. She reports that she did not need anyone to talk about this subject, because it was already her own will to return to her studies. He made a first attempt to return to school, having attended for two years, but interrupted his studies again for six months, having returned later to finish. He reports that the time he was away from school was complicated, as he hardly saw any prospects for life, since better jobs depended on complete schooling. It also addresses the hope of entering higher education, as the job in which he is currently finds himself allows for an improvement in the financial situation. He states that if there is a need to change jobs again, the chances of getting a new job are greater due to schooling. He says that this is fundamental in the lives of all

people, because the more you study and even specialize, the opportunities in the job market will increase and this contributes to a financially more peaceful life, as well as to a quality of life.

There is currently a chronic decline in sectors of the labour market that require minimum qualifications. This means that the expectations of the "knowledge society" put more pressure on individuals required to demonstrate certain standards of knowledge and qualifications. For those who do not comply, there are much more serious consequences than in traditional industrial societies. Of course, the logic of exclusion depends on the same mechanism. Social class and gender continue to be determining factors. However, age also plays an increasing role (Souza, 2016). Accompanied by the end of studies, the perspective of the future arises, in which it makes it possible to open doors to the job market with better chances of professional growth. Job search is a situation that not only demonstrates recent changes in the organization of the labor market, but also unveils the function of social relations in modern society (Brandão, 2015).

Employee 02, also 35 years old, is single, but in a stable union for 5 years and father of a 5-year-old daughter. He presents that he works as an Agricultural Machine Operator, working with a tractor in soil preparation for planting, in the cultivation of sugarcane, as well as working with pesticides to improve the quality of production. He points out that he finished his studies through EJA, but that he had interrupted his studies in the 8th grade of Elementary School. He adds that at the time he worked a lot, it was excessive work and that it required a lot of physical strength. He started working at the age of 13 as a bricklayer's servant and in the field harvesting passion fruit and potatoes. He says that the reason for his return to school was because companies require at least complete high school and that he was running out of opportunities in the job market. The initiative to return to studies came from the employee himself, who was interested in growing in his work and would only be able to do so when he had completed his studies. He felt different from his co-workers, because of the little study. Currently, he feels more fulfilled, for changing professions in the company, going from agricultural assistant (he worked exposed to the sun) to control, of a fully automated machine, with air conditioning and a higher salary. The collaborator learned about the EJA program through the internet, and did not know anyone who had already done it, but when he returned to his studies he met many people who were in the same situation. He reinforces that his life has improved a lot, and highlights that these improvements happened through the study. He believes that with this, his career will continue to improve, as well as his professional expectations.

With the participants' speeches, we verified that the need to work is a persistent challenge for young people from more vulnerable economic classes in Brazil (Brenner; Carrano, 2023). Thus, when investigating the meaning attributed to the return to schooling from EJA, we identified that the reconfiguration of life projects and dreams postponed by different circumstances is evident in the participants' speech. Schooling is linked to future projections and reformulations in life projects, bringing meaning to the new search for schooling (Costa, 2011).

Brenner and Carrano (2023) highlight that work and school are social spaces and times that, when articulated, produce expectations and make life projects viable, and work should not only be understood as a search for means of subsistence, but also as the search for independence and autonomy on the part of students.

In view of this perspective presented by the participants, we understand that Psychology plays an important role in education, developing activities that can enable the improvement of teaching and learning processes, creating interventions that allow the overcoming of processes of exclusion, pathology and social stigma. The inclusion of psychologists in schools should be seen as a means of promoting inclusive practices and ensuring the rights and access to schooling for all. Its results also permeate teacher training that addresses the development of human subjectivity, the impact of social relations and its connection with the educational process (Massimi, 1987).

The insertion of psychologists in schools should be seen as an improvement in inclusion practices and as a guarantee of the rights of those involved. Psychology is able to understand the teaching-learning process and its combination with development, based on the reflection of subjectivities, personality in general, conflict, reconciliation and overcoming. Thus, providing categories and theoretical concepts for the understanding of the psychological processes, necessary for the formation of the subject, the educational process and the implementation of educational activities (Massimi, 1987).

The history of School and Educational Psychology in Brazil can be mentioned since colonial times, when concerns with education had at their core compositions about the psychological phenomenon. In the nineteenth century, psychological ideas articulated with education were also produced within other areas of knowledge, although in a more institutionalized way (Massimi, 2001).

To this end, the performance of the educational psychologist must be guided by the mastery of the theoretical framework, as well as specific knowledge in the field of education and other fields of knowledge integrated in the academic environment. The theoretical framework that we defend here is to go beyond the traditional practices of school

psychologists, which are often based on a perspective, not always conscious or assumed, of clinical therapeutic action (Massimi, 1987). On a daily basis, the educational psychologist needs to break with actions that are only based on this clinical practice in the educational context, but that promote the development of students' autonomy, thus contributing to be more active in society and in the relationships established, including promoting the guarantee of the right to education.

CONCLUSION

In view of the results raised regarding the theme, it can be understood that most of the subjects who drop out of school or did not attend school are to enter the labor market, due to financial needs and their own subsistence. The two employees interviewed present the same reason, saying that they started a heavy work to support themselves and their family. However, it is identified that the return to studies is for the same reason as giving up, to seek better job opportunities, based on greater schooling.

It can be considered that the most vulnerable classes face the challenges of choosing between school and work, due to socioeconomic needs. It is extremely important to increase the education and qualification of the population, in order to reduce educational inequality. The increase in schooling and the expansion of qualifications could contribute to facilitate insertion in the labor market.

In addition to compromising the cognitive, intellectual and cultural development of individuals, school dropout is a direct reflection of the difficulty of insertion in the labor market. People who are unable to finish their studies usually end up occupying informal positions, with lower qualifications and lower remuneration. For the marginalized classes in a society, the difficulties in dedicating themselves to studies prevent these people from getting out of this condition.

When students miss or fail to attend classes, it takes a close look to understand the reasons that keep them away from the classroom. Knowing the reality of students and families, in the place where the school is inserted, is essential for managers to create strategies for students to remain in schooling. It is also important to invest in technology and make the school more attractive to students, with methodologies that respond to their needs and that accompany the new generation. Finally, it is important to develop public policies that not only reduce school dropout, but also minimize the inequalities faced by students/workers.

Some productions in the field of Psychology have fertilized the terrain of the individualization of school performance and social inequalities, developing research and

theoretical explanations that focus on the characterization of disadvantaged groups (Barros, 2005). Thus, Psychology needs to problematize this modeling machinery, which is often the school space, affirming it as a source of knowledge and invention of new subjective forms (Heckert; Barros, 2007).

Rocha (1996, p. 179) points out that "school life can unfold in perspectives that make it leave the condition of user of the instituted paradigms, transforming itself into a factory of knowledge". And this "factory school of knowledge" is there where humans fight, sweat and create, "it is up to give visibility and speakability to these movements that, allied with the invisible, produce objects and subjects that are not modeled" (Oliveira, 2001, p. 237). Change and improvement only start from human potential, each subject must face what he wants, in this sense, the school proposes a process of schooling and the subject's internal movement is equivalent to this continuity (Frigotto, 1998).

From the discussions proposed here, we believe we have fulfilled the objectives of the study, but we defend the need for continuity of research that addresses the challenges and opportunities of rural workers' access to educational programs, with emphasis on Youth and Adult Education (EJA) and the contributions of Psychology to an autonomous human development. in which everyone has the right to access education.

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