

WIRELESS COMPUTING TOOL WITH RFID AND ESP32 IN SUPPORT OF LITERACY: A QUALITATIVE CASE STUDY

FERRAMENTA COMPUTACIONAL SEM FIO COM RFID E ESP32 NO APOIO À ALFABETIZAÇÃO: UM ESTUDO DE CASO QUALITATIVO

HERRAMIENTA INFORMÁTICA INALÁMBRICA CON RFID Y ESP32 PARA APOYAR LA ALFABETIZACIÓN: UN ESTUDIO DE CASO CUALITATIVO

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ABSTRACT

The objective of this study was to evaluate the application of a tangible, wireless educational technology, based on ESP32 and RFID, to support the literacy process of children with writing difficulties. The research was conducted in a public school, involving ten third- and fourth-grade students and a literacy teacher. Over ten workshops, the technology mediated reading, writing, and phonological awareness activities. The children were assisted in tasks such as reading, writing words, and recognizing letter sounds. The results demonstrated that the technology proved to be a highly effective resource in the literacy process. Data collection included observations of the participants, analysis of written productions, records of correct and incorrect answers, and evaluation of student progress by the literacy teacher. Content analysis was used, which indicated significant advances in phonological awareness, self-correction, autonomy, and engagement of the children. Among the most relevant occurrences was the advancement in understanding the grapheme-phoneme relationship. The tangible interface, combined with instant auditory feedback, promoted greater participation and focus, allowing for longer work periods with less need for researcher intervention. The teacher evaluated the tool as easy to use, requiring low infrastructure, and applicable to different school contexts. The study thus highlights the potential of tangible educational technologies as cognitive mediators in the initial literacy process of children with learning difficulties, while also emphasizing the importance of continuous teacher training.

Keywords: Literacy. Tangible Educational Technologies. Learning Difficulties. ESP32 and RFID. Phonological Awareness.

RESUMO

O objetivo deste trabalho foi avaliar a aplicação de uma tecnologia educacional tangível e sem fio, baseada em ESP32 e RFID, como suporte ao processo de alfabetização de crianças com dificuldades de escrita. A pesquisa foi conduzida em uma instituição pública de ensino, envolvendo dez alunos do terceiro e quarto ano e uma professora alfabetizadora. Ao longo de dez oficinas, a tecnologia mediou atividades de leitura, escrita e consciência fonológica.

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As crianças foram assistidas em tarefas como leitura, escrita de palavras e reconhecimento dos sons das letras. Os resultados demonstraram que a tecnologia se revelou um recurso altamente eficaz no processo de alfabetização. A coleta de dados incluiu observações dos participantes, análise das produções escritas, registros de acertos e erros, além da avaliação do progresso dos alunos pela professora alfabetizadora. Utilizou-se a técnica de análise de conteúdo, que apontou avanços significativos na consciência fonológica, na autocorreção, na autonomia e no engajamento das crianças. Entre as ocorrências mais relevantes destacou-se o avanço na compreensão da relação grafema-fonema. A interface tangível, aliada ao feedback sonoro instantâneo, promoveu maior participação e foco, permitindo períodos de trabalho mais prolongados e com menor necessidade de intervenção do pesquisador. A professora avaliou a ferramenta como de fácil uso, de baixa demanda de infraestrutura e aplicável a diferentes contextos escolares. O estudo evidencia, assim, o potencial das tecnologias educacionais tangíveis como mediadoras cognitivas no processo inicial de alfabetização de crianças com dificuldades de aprendizagem, ao mesmo tempo em que ressalta a importância do treinamento contínuo dos professores.

Palavras-chave: Alfabetização. Tecnologias Educacionais Tangíveis. Dificuldades de Aprendizagem. ESP32 e RFID. Consciência Fonológica.

RESUMEN

El objetivo de este estudio fue evaluar la aplicación de una tecnología educativa tangible e inalámbrica, basada en ESP32 y RFID, para apoyar el proceso de lectoescritura de niños con dificultades de escritura. La investigación se llevó a cabo en una escuela pública, con la participación de diez estudiantes de tercero y cuarto grado y un docente de lectoescritura. A lo largo de diez talleres, la tecnología facilitó actividades de lectura, escritura y conciencia fonológica. Los niños recibieron asistencia en tareas como leer, escribir palabras y reconocer los sonidos de las letras. Los resultados demostraron que la tecnología resultó ser un recurso altamente efectivo en el proceso de lectoescritura. La recopilación de datos incluyó observaciones de los participantes, análisis de producciones escritas, registro de respuestas correctas e incorrectas, y evaluación del progreso estudiantil por parte del docente de lectoescritura. Se utilizó el análisis de contenido, el cual indicó avances significativos en la conciencia fonológica, la autocorrección, la autonomía y la participación de los niños. Entre los avances más relevantes se encuentra el avance en la comprensión de la relación grafema-fonema. La interfaz tangible, combinada con la retroalimentación auditiva instantánea, promovió una mayor participación y concentración, permitiendo períodos de trabajo más largos con menor necesidad de intervención del investigador. El docente evaluó la herramienta como fácil de usar, con baja infraestructura y aplicable a diferentes contextos escolares. Por lo tanto, el estudio destaca el potencial de las tecnologías educativas tangibles como mediadores cognitivos en el proceso de alfabetización inicial de niños con dificultades de aprendizaje, a la vez que enfatiza la importancia de la formación docente continua.

Palabras clave: Alfabetización. Tecnologías Educativas Tangibles. Dificultades de Aprendizaje. ESP32 y RFID. Conciencia Fonológica.

1 INTRODUCTION

Educational inclusion is a principle that ensures all students, regardless of their particularities, such as disabilities or specific educational demands, the same access to regular education. Although there are legal frameworks that guarantee the presence of people with disabilities in schools, Silva *et al.* (2025b) highlight that simply inserting these people in learning environments is not equivalent to promoting genuine inclusion. To achieve true inclusion, it is necessary to confront and overcome the various obstacles that still exist in our education system (Araújo *et al.*, 2025).

Among these barriers, the pedagogical one stands out, which concerns the lack of adaptation of teaching techniques to the varied educational demands of students. This can include the lack of methods that take into account and respect the various forms of learning, rhythms and styles of each student. A considerable challenge that affects the effectiveness of the teaching-learning process is the difficulty in adjusting the content, tasks and assessments to the particularities of students with specific needs. Cardoso, Santos, Mendonça Neto (2025) and Furtado, Almeida, Kohls-Santos (2025) address the way in which technologies, especially robotics, can provide multidisciplinary resources and curricular flexibility, benefiting varied strategies to access content and assessments. Silva *et al.* (2025c) suggest that collaborative and flexible methodologies are solutions to overcome these challenges. The absence of truly inclusive education for all students not only diminishes learning opportunities, but can also generate a negative environment in which these students feel excluded or unmotivated.

Another aspect to be considered is literacy, which plays a fundamental role in the school trajectory of any child. The literature on education shows that many students have difficulties at this time of learning and this is even clearer for those who have specific needs (Matos; Santos, 2021; Lyre; Silva; Silva Neto, 2024; Cardoso, 2022; Viana; Amorim; Amorim, 2023). Literacy involves not only the decoding of words, but also the comprehension of texts and written production, being a milestone for the academic and social development of students. Therefore, pedagogical intervention is essential in this scenario. According to Martins, Giraffa, and Raabe (2021), pedagogical practices that use innovative technologies, such as robotics, favor the development of reading and writing skills, in addition to transforming the environment into a place conducive to experimentation and creativity. In the same sense, Cardoso, Santos, Mendonça Neto (2025) and Furtado, Almeida, Kohls-Santos

(2025) point out that technological resources help to minimize barriers by stimulating student participation.

In addition, Oliveira, Senff and Silva (2024) say that the training of teachers and educators is a key point to make education truly inclusive. In order for education professionals to be able to meet the various needs of their students, they need to have access to the right training that helps them see and deal with differences (Dias *et al.*, 2024). This not only involves theoretical knowledge but also the practice of inclusive methodologies that create a collaborative learning environment where all students feel valued and respected.

The interaction between students, teachers and the school community as a whole is also fundamental for the creation of an inclusive environment (Silva *et al.*, 2025b). It is essential that there is a collective awareness about the relevance of inclusion and respect for diversity. A joint and collaborative effort can encourage behavioral changes and actions that promote inclusion, allowing students with specific needs to feel part of the group while other students cultivate empathy and respect for diversity (Silva *et al.*, 2025b).

Educational inclusion, according to Araújo and Silva (2025), is not only about policies and guidelines; it is a cultural change involving all participants in the educational process. The authors believe that educational inclusion is the construction of a fairer society where everyone has the same opportunities to learn. To continue on this path, it is essential to carry out a continuous diagnosis of pedagogical practices, as well as evaluations that take into account the progress of each student according to their needs and abilities. The search for inclusion must be a continuous search for improvement in the quality of teaching, offering solutions to enable learning for all (França *et al.*, 2025; Pires, 2025).

Educational inclusion can be a complex goal that requires a joint and multidisciplinary effort in which the uniqueness of each student is considered and respected. For Riboli and Pertuzzatti (2025), overcoming pedagogical barriers and creating a welcoming environment are essential steps to ensure that all students, especially those with specific educational needs, can achieve their goals and experience the full development of their potential. By prioritizing inclusion in the educational scenario, we contribute to forming not only competent individuals, but also conscious, responsible and supportive citizens.

2 METHODOLOGY

The study is an applied research, with a mixed approach (qualitative and quantitative), and an exploratory case study. The objective was to evaluate the pedagogical effectiveness



of a wireless computational tool made with ESP32 microcontroller and *Radio-Frequency Identification* (RFID) module, which was designed to help in the literacy process of children with learning difficulties in the writing system.

2.1 CONTEXT AND PARTICIPANTS

The research took place in a public school in the municipality of Camboriú in Santa Catarina, together with a literacy teacher from the basic education network. There were ten children from 8 to 10 years old regularly attending the 2nd and 3rd years of elementary school. It was reported by the pedagogical team that these children were presenting chronic difficulties in reading and writing.

For a more detailed analysis, three participants were chosen as cases for closer observation, considering their school history, the level of development of phonological awareness and the degree of difficulty in grapheme-phoneme correspondence.

2.2 DESCRIPTION OF THE WIRELESS COMPUTING TOOL

The instrument developed was a wireless computational tool using the RFID system (it is composed of the ESP32 microcontroller and the RFID module). It was programmed to identify labels containing letters, syllables, and words to be learned. When the card is brought close to the reading surface, the student receives immediate sound feedback, making sure that the answer is right or wrong. This contributed to the self-correction process and helped to reinforce the grapheme-phoneme relationship.

The tool does not automatically store data or log logs. The researchers evaluated the students' performance based on observation, analysis of written productions, as well as their manual records throughout the workshops. The practical implementation was supported by ten literacy workshops held over five weeks, reading, writing and phonemic identification activities. Such activities were carried out assisted by the researchers and by a literacy teacher, actively participating in the group, who collaborated in the pedagogical practices planned by the researchers.

2.3 DATA COLLECTION PROCEDURES

Data collection was based on three complementary sources:

- 1. Participant observation:** the researchers manually recorded the number of successes and errors that the students made during the activities mediated by the tool,



in addition, they wrote down behaviors such as engagement, attention, frustration, and forms of self-correction.

- 2. Written productions and oral readings:** the students carried out spontaneous reading and writing activities before and after the workshops, which made it possible to analyze the evolution in the domain of the writing system.
- 3. Teacher feedback and field diary:** teachers shared their impressions about the tool, addressing aspects such as pedagogical adequacy, student engagement and identified difficulties.

Finally, the data were treated qualitatively, through content analysis (Bardin, 2011), focusing on engagement, autonomy, necessary pedagogical help and use of phonological awareness. The numerical records produced manually (hits and misses by activity) were allocated in simple tabulations to allow descriptive analysis.

2.4 ETHICAL ASPECTS

The study was carried out in accordance with the general principles of Resolution No. 466/2012 of the National Health Council, particularly regarding confidentiality, anonymity and free consent. The project was endorsed by the Ethics Research Committee of the Federal Institute of Santa Catarina (IFC).

3 RESULTS AND DISCUSSION

3.1 EVIDENCE OF PERFORMANCE OBSERVED DURING THE USE OF THE TOOL

During the workshops, it was possible to observe a progressive improvement in the accuracy and fluidity in the performance of the task by the students. Although the tool did not store data automatically, the researchers manually recorded the successes and errors of each student in each activity, allowing them to identify patterns of evolution.

The descriptive analysis of these records showed that:

- students started to make **fewer syllable identification errors**, especially in the most common combinations (ba, ca, la, pra, tra);
- there was a **visible reduction in the teacher's need for mediation**, as immediate sound feedback allowed self-correction;
- students demonstrated greater speed in decision-making, even without formal automatic measurement;

- Three students initially classified as "with high phonological deficit" began to identify simple syllables with greater confidence.

These results were organized in simple tables based on the researchers' records, allowing them to monitor the performance throughout the workshops.

Table 1

Participant A1

PRETEST	ACTIVITY - A	ACTIVITY - B
READING AND AWARENESS OF RHYMES	WORD SYLLABLE RECOGNITION	RECOGNITION OF WORD PHONEMES
Rhyming AWARENESS	SLABIC AWARENESS	PHONEMIC AWARENESS
1 - Who lives in Caco's house?		
A: Pre-test: Magco	MA-CA-CO	/m/a/c/a/c/o/
A: Post-test: APE	MA-CA-CO	M/A/C/A/C/O
2 - Who lives in the beautiful house?		
A: Pre-test: Beautiful	CABOITO	c/a/b/oi/t/o
A: Post-test: CABRITA	CA- BR - ITA	C/A/B/R/I/T/A
3- Who lives in the cement house?		
A: Pre-test: cement	JU O	Did not complete
A: Post-test: DONKEY	JU-ME-NTO	J/U/M/E/N/T/O

Source: the authors (2025)

Table 1 shows the evolution of some activities of participant A1, a 9-year-old child. She is in the third year of elementary school and has speech problems. It is in the syllabic phase with sound value in the literacy process. This level of development is when the child is able to give sounds to syllables, but does not yet have a total correspondence between grapheme and phoneme. This shows that it needs mediated activities to help phonological awareness and the structuring of the writing system little by little.

3.2 QUALITATIVE ANALYSIS OF INTERACTIONS

Content analysis revealed three emerging core categories:

1. Engagement and motivation: students demonstrated greater willingness to repeat the activities and satisfaction with the sound feedback of the tool, perceived as a "game of letters";
2. Autonomy and self-correction: immediate feedback reduced teacher dependence and favored self-correction of spelling errors;

3. Pedagogical mediation: the role of the literacy teacher remained essential to guide the didactic sequence, reinforcing the complementary character of technology.

Direct observation showed that there was an increase in participation and attention maintained during activities, especially among children who had more difficulties at the beginning. These results confirm the researchers' hypothesis, a principle also defended by Felipe (2015), that linguistic and phonological mediation, when supported by technological resources, increases the chances of meaningful learning.

3.3 SYNTHESIS AND EDUCATIONAL IMPLICATIONS

The results show that the wireless technology used was a good cognitive and pedagogical mediator, bringing clear gains in student performance and motivation. By combining physical and computational interactivity, the system increases the chances of digital and educational inclusion in literacy situations for children with problems learning to write. These findings confirm the central hypothesis that tangible interaction, mediated by an accessible and responsive computer system, enhances the literacy process. The research reinforces the need for continuing teacher training focused on the use of assistive technologies and intelligent tools in the school context.

3.4 ANALYSIS OF THE INTERACTION AND USABILITY OF THE TOOL

The responsiveness, clarity and level of engagement generated by the tool's physical interface, which consists of RFID cards and sound feedback, were evaluated. It was found that the use of multimodal stimuli (tactile, auditory and visual) prolonged the time students dedicate to activities and decreased distraction behaviors. This evidence supports the usability principles presented by Norman (2006) and Papert (1980), emphasizing that tangible design enriches active and exploratory learning.

In order for students with different cognitive and motor needs to be able to use the tools in an intuitive and motivating way, it is essential that assistive technologies are easy to use. Recent research suggests that engagement increases when the interface provides instant feedback and various forms of sensory stimulation, expanding student autonomy and reducing the need for constant teacher intervention (Reinert Junior; Coutinho, 2024). Therefore, usability should be evaluated not only by ease of use, but also by the ability to maintain student engagement and interest in inclusive environments.

3.5 COGNITION AND MEDIATION IN THE PROCESS OF TECHNOLOGY-ASSISTED LITERACY

The wireless computational tool was incorporated as a symbolic mediator of the process of internalization of grapheme-phoneme relations. Technology, by offering, from immediate self-correction, the Zone of Imminent Development (Prestes; Tunes, 2022), linked to the transition between the potential and actual level of performance, does not replace the role of the teacher, but expands the necessary conditions for individualized learning.

In addition, technological mediation increases the cognitive repertoire of students by offering interactive experiences that consolidate essential skills such as phonological awareness and visual recognition of writing symbols. Mediation based on technological resources allows each student to advance at their own pace, favoring a more inclusive and personalized literacy (Abrão; Del Pino, 2016). Teacher monitoring continues to be very important to ensure that dialogued mediation helps to overcome specific difficulties and to promote the meaningful use of technology in the educational process.

3.6 TEACHER PERCEPTIONS AND RECONFIGURATION OF LITERACY PRACTICE

The reports of the teachers' narratives highlighted the relevance of diversifying teaching strategies and increasing the engagement of the tool by students. Linked to this, teachers highlighted the ease of use and potential for adaptation to the students' ability to understand. However, the need for continuing education in educational technologies was also immediately pointed out, as reiterated by Felipe (2015), who argues that (psycho)linguistic and technological competence is essential for the very performance committed to training. In addition, recent evidence proves that, although assistive technologies mean a transformational potential, this breadth depends on the institutional offer of continuing technical and pedagogical training.

According to Cavalcante, Marques and Nunes (2024), training results in greater security for pedagogical use, which translates into greater investment and quality in the mediation of learning and school inclusion. The challenge is to extend this support to the entire education network, minimizing inequality in the promotion of these technologies.

3.7 INCLUSION AND DIGITAL EQUITY IN LITERACY

The tool was created using accessible components and open architecture, making it possible to use it in schools with limited budgets. This indicates that it can be a beneficial



technology for all, promoting equal access to learning experiences through technology. The research shows that the popularization of technologies for teaching depends on training and infrastructure policies that ensure pedagogical and technical sustainability.

In addition, digital equality in literacy needs strong public policies that guarantee not only the distribution of devices, but also quality internet access, adequate infrastructure, and technical support in schools (Silva *et al.*, 2025a). Without these investments, new technologies can increase existing differences rather than diminish them. Digital literacy for all is therefore also a social justice issue that needs the union between government, business and school.

4 FUTURE PERSPECTIVES

The tool's data collection structure allows for the integration of artificial intelligence (AI) models, which can recognize error patterns and suggest personalized interventions. Future versions may include voice recognition modules and algorithms that suggest activities, thus expanding the possibilities of early diagnosis and personalization of teaching.

In this context, adding AI to the literacy process not only improves the monitoring of individual learning, but also makes the chances of quick and customized interventions that are very important to deal with the various challenges easier (Azambuja; Silva, 2024). This combination of techniques can help in a more active, interesting and student-focused literacy, respecting their own way and helping in effective digital inclusion.

5 CONCLUSION

The analysis of the highlighted items shows that assistive technology, especially when used with tangible interfaces and multimodal feedback, increases active learning, engagement, and autonomy of students with literacy difficulties. Technological mediation, together with pedagogical practices, strengthens individualized learning, without replacing the role of the teacher, whose continuous technical and pedagogical training is essential to maximize the benefits of technology.

Digital equity emerges as a structural challenge that must be addressed through integrated public policies to ensure access, infrastructure, and training. Finally, future perspectives show that AI will be a great ally to personalize teaching, make more accurate diagnoses, and increase educational inclusion.

These findings underscore the importance of coordinated investment in technology, training, and inclusive policies to truly change literacy processes in Brazil, guaranteeing the broad right to education for all.

REFERENCES

- Abrão, K. R., & Del Pino, J. C. (2016). Cognição e aprendizagem no espaço da tecnologia. *Revista Ibero-Americana de Estudos em Educação*, 11(4), 1776–1798. <https://doi.org/10.21723/riaee.v11.n4.5934>
- Araújo, A. T. de, Daleaste, R. F., Morais, M. D. de, Andrade, S. V. R. de, & Priotto, E. M. T. P. (2025). A diversidade da inclusão educacional e as necessidades formativas de professores da educação básica: Revisão integrativa. *Educação*, 50(1), Article e15. <https://doi.org/10.5902/1984644471465>
- Araújo, O. da S., & Silva, A. J. da. (2025). Políticas públicas e inclusão escolar: Avanços e desafios na Educação Básica. *Caderno Pedagógico*, 22(9), Article e18748. <https://doi.org/10.54033/cadpedv22n9-487>
- Azambuja, C. C. de, & Silva, G. F. da. (2024). Novos desafios para a educação na Era da Inteligência Artificial. *Filosofia Unisinos*, 25(1), 1–16. <https://doi.org/10.4013/fsu.2024.251.07>
- Bardin, L. (2011). *Análise de conteúdo*. Edições 70.
- Cardoso, C. C., Santos, T. V. dos, & Mendonça Neto, V. dos S. (2025). Pensamento computacional e robótica educacional como metodologia ativa na educação profissional e tecnológica. *Revista Ciências & Ideias*, 16(1), Article e25162770. <https://doi.org/10.22407/2176-1477/2025.v16.2770>
- Cardoso, L. R. C. de O. (2022). Fracasso escolar ou dificuldade de aprendizagem? *Revista Científica Novas Configurações – Diálogos Plurais*, 3(4), 19–28.
- Cavalcante, J. L., Marques, L. T., & Nunes, R. F. (2024). Revisão sistemática da literatura sobre a percepção dos docentes acerca do uso das TDICs na Educação Profissional e Tecnológica. *Em Teia | Revista de Educação Matemática e Tecnológica Iberoamericana*, 15(2), 12–37. <https://doi.org/10.51359/2177-9309.2024.264093>
- Cirino, R. M. B. (2025). Inclusão educacional: Tensões e intenções nos projetos dos cursos de licenciatura. *Revista Contexto & Educação*, 40(122), Article e16687. <https://doi.org/10.21527/2179-1309.2025.122.16687>
- Dias, C. A. F. B., Silva, F. A. da, Lima, E. B. T., Oliveira, L. A. C. de, Silva, S. C. B. da, Silva, L. R. da, Baiense, T. P., Santos, L. C. da S., Caetano, J. B. P., Oliveira, J. L., & Oliveira, L. L. (2024). Inovações pedagógicas para a educação inclusiva: Práticas transformadoras em destaque. *Revista Foco*, 17(7), Article e5721. <https://doi.org/10.54751/revistafoco.v17n7-107>
- Felippe, A. do P. (2015). A importância da formação (psico)linguística do professor alfabetizador para a obtenção de bons resultados na alfabetização [Dissertação de mestrado, Universidade Federal de Santa Catarina]. Repositório Institucional UFSC. <https://repositorio.ufsc.br/xmlui/handle/123456789/169372>

- França, L. F., Carvalho, E. C. da S., Rodrigues, L. E., Santos, Z. A. C. dos, & Ribeiro, P. (2025). O impacto da robótica educacional na educação de alunos com autismo. *Lumen Et Virtus*, 16(46), 2132–2146. <https://doi.org/10.56238/levv16n46-038>
- Furtado, L. D., Almeida, H. C., & Kohls-Santos, P. (2025). A robótica educacional como recurso metodológico para o desenvolvimento de competências socioemocionais no Ensino Médio. *Revista Edutec - Educação, Tecnologias Digitais e Formação Docente*, 5(1).
- Lira, J. V. D., Silva, M. V. R. da, & Silva Neto, J. F. da. (2024). Dificuldades de aprendizagem matemática: O que dizem as pesquisas recentes. *Educação Matemática em Revista - RS*, 1(25), 54–61. <https://doi.org/10.37001/EMR-RS.v.1.n.25.2024.p.54-61>
- Martins, C., Giraffa, L., & Raabe, A. (2021). Práticas pedagógicas remixadas: Tendências da cultura digital. Editora Unoesc. <https://hdl.handle.net/10923/19381>
- Matos, E. F. de, & Santos, D. M. F. (2021). Discalculia e educação: Quais conhecimentos os professores possuem acerca deste tema. *Revista Psicopedagogia*, 38(116), 272–283. <https://doi.org/10.51207/2179-4057.20210015>
- Norman, D. A. (2006). *O design do dia a dia*. Rocco.
- Oliveira, J. G. de, Senff, J. R. G., & Silva, S. S. de C. (2024). Formação docente: O uso das tecnologias digitais em uma perspectiva inclusiva. *Revista InCantare*, 21(2), 1–13. <https://doi.org/10.33871/2317417X.2024.21.2.8785>
- Papert, S. (1980). *Mindstorms: Children, computers, and powerful ideas*. Basic Books.
- Pires, N. S. (2025). Inclusão educacional: Perspectivas para estudantes com deficiência. *International Integrate Scientific*, 5(46).
- Prestes, Z. R., & Tunes, E. (2022). Pontes ou muralhas: Exame crítico de traduções de conceitos da teoria histórico-cultural. *Revista Educativa*, 25(1), 1–19. <https://doi.org/10.18224/educ.v25i1.12439>
- Reinert Junior, A. J., & Coutinho, D. J. G. (2024). A eficácia das tecnologias assistivas na alfabetização de alunos com deficiência na educação básica. *Revista Ibero-Americana de Humanidades, Ciências e Educação*, 10(11), 2088–2100. <https://doi.org/10.51891/rease.v10i11.16777>
- Riboli, C., & Pertuzzatti, M. T. (2025 Vend.). Educação especial inclusiva e políticas públicas: Avanços, desafios e perspectivas. *Revista Brasileira de Educação Especial*, 31. <https://doi.org/10.1590/1980-5470/2025/123456>
- Silva, N. A. dos S., & et al. (2025a). Tecnologias digitais e equidade escolar: Caminhos para a aprendizagem inclusiva. *Missioneira*, 27(8), 11–20.
- Silva, P. R. de J., Barros, A. B., Figueredo, A. Z. dos S. C., & Barros, G. D. da S. (Orgs.). (2025b). *Inclusão escolar: Perspectivas e práticas no atendimento educacional especializado* (1ª ed.). Aya Editora. <https://ayaeditora.com.br/Livro/39265>
- Silva, S. M. de O., Fonsêca, A. T. L., Fonseca, Ê., Silva, G. M., Ramos, K. P., Louza, L. F., Reis, L. M. dos, & Marinho, R. F. (2025c). Robótica educacional e competências do século XXI. *Cuadernos de Educación y Desarrollo*, 17(4), Article e8041. <https://doi.org/10.55905/cuadv17n4-081>



Viana, E. C., Amorim, R. J. R., & Amorim, D. G. (2023). Desafios e dificuldades enfrentados pelos estudantes no processo de aprendizagem matemática. *Cuadernos de Educación y Desarrollo*, 15(12), 15672–15693. <https://doi.org/10.55905/cuadv15n12-031>