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Inclusive mathematical education and visual impairment: an overview of Brazilian research

ARTICLE

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Abstract
This literature review article (LRA) aims to analyze dissertations and theses in the field of mathematics education that discuss teacher training and teaching practices with visually impaired students. Its theoretical framework is based on studies by Fernandes and Heally (2011), Moura (2015), Vasconcelos and Manrique (2014), Silva (2010) and Barbosa *et al*. (2020). The LRA was developed according to Hohendorff (2014) and guided by a qualitative approach, based on the selection of productions, using specific descriptors, from the period 2015-2023 available in the BDTD, analyzing them according to the interpretive perspective conceptualized by Stake (2011). In light of the investigative process developed, the publications present the following areas of focus: "Initial and continuing teacher training," "Classroom practices," and "Production and analysis of teaching materials." In this regard, further studies are needed so that we can broaden the discussion of visual impairment in the context of inclusive mathematics education.
Keywords: Mathematics Education. Inclusive Education. Visual Impairments. Teachers Training.

Educação matemática inclusiva e deficiência visual: um panorama das pesquisas brasileiras

Resumo
Este artigo de revisão da literatura (ARL) objetiva analisar dissertações e teses, no campo da educação matemática, que dialogam com a formação de professores e a ação docente com estudantes com deficiência visual. Possui como referencial teórico os estudos de Fernandes e Heally (2011), Moura (2015), Vasconcelos e Manrique (2014), Silva (2010) e Barbosa *et al*. (2020). O ARL foi desenvolvido segundo Hohendorff (2014) e norteado por uma abordagem qualitativa, a partir da seleção de produções, com base em descritores específicos, do período de 2015-2023 disponíveis no BDTD, analisando-as segundo a perspectiva interpretativista conceituada por Stake (2011). Face ao processo investigativo desenvolvido, as publicações apresentam como campo de abordagem: "Formação inicial e continuada de professores", "Práticas na/para sala de aula" e "Produção e análise de materiais para o ensino". Nessa perspectiva, novos

estudos são necessários, para que possamos ampliar a discussão da deficiência visual no âmbito da educação matemática inclusiva.
Palavras-chave: Educação Matemática. Educação Inclusiva. Deficiência Visual. Formação de Professores.

1 Introduction

The Brazilian Constitution of 1988, in Article 208, establishes school inclusion as a constitutional precept, emphasizing the provision of services to persons with disabilities in the regular school system. In 2009, Brazil ratified the UN Convention on the Rights of Persons with Disabilities (CRPD), which guarantees the right to Specialized Educational Services (AEE) during after-school hours for students with disabilities in regular schools.

Due to this process, there were changes in concepts that arose with the advent of the National Policy on Special Education from the Perspective of Inclusive Education (PNEEPEI), which makes special education a cross-cutting modality at all levels, stages, and types of education, no longer serving as a substitute for school (Brasil, 2008). From that moment on, the school takes on the role of providing resources, services, and accessibility strategies in order to promote school inclusion.

Given this reality, the pursuit of understanding the inclusion process and the reflection of these actions in the teaching-learning process has become a focus of interest in various settings. In this paper, we will highlight discussions that address the inclusion of students with visual impairments.

When focusing on students with visual impairments, it is clear that the difficulty is not cognitive, but physical; therefore, what limits them in the learning process is the way in which it takes place. In mathematics, Fernandes (2004, pp. 128-129) addresses this issue:

> There is no area of mathematics that is off-limits to blind people. We need only recall Leonhard Euler, Nicholas Saunderson, Lev Semenovich Pontryagin, and so many others. We must be aware that the main difficulties are not necessarily cognitive, but rather material and technical, which often condition the pace of work of a blind student when learning mathematics. [...] By receiving the appropriate stimuli to engage other senses, such as touch, speech, and hearing, students with

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> visual impairments will be able to learn just like sighted students, as long as the uniqueness of their cognitive development is respected.

Vision is one of the senses responsible for much of human development; it is essential for stages of life such as learning to walk, read, start school, and work. According to the World Health Organization (WHO, 2009), in its World Vision Report, approximately 2.2 billion people have some form of vision impairment or blindness. Among these, approximately 1 billion are related to conditions affecting children and adolescents.

In their studies, Barbosa *et al*. (2020) point out that many of the effects caused by vision loss or impairment can be minimized through rehabilitation and adaptation of affected individuals, thereby ensuring accessibility in all areas of life, including educational needs and professional development.

Based on research conducted by Moura (2015), gaps were identified in the training of mathematics teachers, more specifically in teaching knowledge (Tardif, 2006), which is articulated in the process of teaching and learning mathematics to students with visual impairments in regular classrooms at a state school in Campina Grande, Paraíba.

Currently, in the development of a doctoral thesis, we seek to broaden our vision of inclusion and the approach to be followed. To this end, understanding the inclusive scenario is a priority in our studies. Thus, we seek to map and analyze the last ten years, cross-reference what was presented by Moura (2015), and advance new concepts about this inclusive process.

With this in mind, and aware of the problems presented by mathematics teachers – whether in initial or continuing training – there is a gap in practical knowledge to meet the specific needs of this audience, with a view to making learning more accessible.

Based on this, we took the period from 2015 to 2023 as a time frame to investigate what has been developed and present the progress of research that links mathematics teaching and visual impairment, highlighting the theoretical and practical aspects that traverse this relationship. At the same time, we outline the trajectory of inclusive mathematics education in Brazil with regard to working with people with visual impairments.

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In light of the process of including visually impaired students in Brazil, the relevance of literature review as an essential tool for theoretical deepening becomes evident. It is a research technique that provides a consistent conceptual foundation, lending legitimacy and relevance to academic work in the scientific community (Cruz; Ferreira, 2023).

This research is presented as a literature review article (LRA), with a qualitative approach. The study is justified because it addresses a necessary and current issue – inclusion – and, more specifically, we highlight the importance of identifying and reflecting on this process of teaching mathematics to students with visual impairments, according to the established time frame.

The literature review has three subdivisions (narrative review, systematic review, and integrative review), two of which are highlighted when conducting scientific research [...] (Nazareth, 2021, p. 40). This methodological approach aims to conduct a critical evaluation of published material and, in this way, seeks to organize, integrate, and evaluate relevant studies on a given topic (Hohendorff, 2014).

The text is organized in such a way as to facilitate understanding of the investigative process and preliminary results, divided into five sections: 1. Introduction, which presents an overview of the text, containing relevant information for general contextualization, associated with the methodology and results; 2. Theoretical framework, in which we objectively reflect on the training of mathematics teachers to work in inclusive education with visually impaired students; 3. Methodology, in which we describe the methods adopted for data analysis, detailing each choice made in the study; 4. Results and discussion, a section that contextualizes and revisits the objectives, in addition to highlighting the main results found; and 5. Conclusions, in which we present our reflections based on the results obtained.

2 Theoretical framework

Society – with its many challenges – the situation of higher education institutions, and technological innovations lead us to reflect on university teaching. Despite discussions

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that define the role of teachers as assistants in the learning process of their students – without distinguishing between individual characteristics – we are still far from achieving a school built by/for everyone.

In mathematics education, more specifically, André (2018) emphasizes that teacher training is lacking in terms of inclusion. This leads to a lack of knowledge on the subject among teachers, which can hinder the teaching and learning process of mathematics for students in the Special Education target audience. This leads us to reflect on the inclusion that is being put into practice in schools and, specifically, on what disability and diversity are.

The fact is that inclusion is still being camouflaged; teaching in schools remains structured, for the most part, around a traditional approach, in which everyone is seen as having the same abilities, with no guarantee of equity, regardless of their specific needs. This discussion goes beyond disability, as it is clear that each person has their own particular way of learning. The concern with inclusion is, above all, a concern for "everyone."

When conducting a survey of 197 mathematics teachers in the state of São Paulo, Vasconcelos and Manrique (2014) sought to investigate teachers' perceptions of inclusive education. The survey results showed that 82% of teachers reported having knowledge about types of disabilities, autism spectrum disorders, and/or high abilities/giftedness, but only 31% had received training in the area of inclusion. The survey also indicated that only 8% had contact with the subject during their undergraduate studies and that 82% did not seek training at any stage of their professional career.

Although the current discussion on inclusion is supported by the LBI (Brasil, 2015), as in Article 28 of the Statute of Persons with Disabilities – which requires public authorities to ensure the necessary teacher training for inclusive education – there is still a clear lack of training, as teachers feel unprepared to work in the current educational setting.

In this sense, taking students with visual impairments as a reference, there are several factors that need to be reconsidered. According to Pereira and Santos (2011), the focus of these studies includes teaching the Braille system and Soroban, autonomy,

orientation, and mobility in the school environment, teaching the use of assistive technologies, support teachers, among other resources – in addition to considering the knowledge built by teachers throughout their lives.

That said, to ensure that the curriculum is linked to teachers, the National Common Curriculum Base (BNCC) focuses on Specialized Educational Services (AEE), which are organized and offered by the Ministry of Education in Multifunctional Resource Rooms in regular public schools, through the Multifunctional Resource Room Implementation Program, established by MEC/SECADI through Ministerial Ordinance No. 13/2007, enabling the provision of specialized educational services to complement or supplement schooling.

The educational and legal landscape continues to pursue the ideal of true inclusion. There is also a great deal of research being conducted in higher education institutions with the aim of addressing the issue of initial and continuing education from this inclusive perspective.

For a student with visual impairment, exploring their other senses is essential – and in mathematics, it is no different. Teachers Fernandes and Healy (2011), in their work entitled *Relationships between the "seen" and the "known": representations of three-dimensional shapes made by blind student*s, demonstrate an experiment carried out with blind students in the exploration of touch.

The focus was on the representation of three-dimensional objects that, when explored by sighted students, require only visual perception. This research aimed to understand how geometric thinking develops in students with visual impairments, based on comparisons with objects that are part of their everyday lives. With this, the authors sought to "investigate the influence of tactile perception, provided by material tools, on the conception of what is 'seen' and 'known' by learners without visual acuity within normal standards."

In the work developed, participants were able to carry out group activities and thus develop collaboration – both among the students themselves and with the researcher.

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According to the authors, the students were able to perform tactile exploration, and the material they used produced the tactile drawing.

In his dissertation, Silva (2010) used the Social Design methodology and created an adapted comic book, in which he presented Thales' Theorem in a dynamic and attractive way. The material was produced using resources such as Braille writing materials, a slate and stylus, a Braille printer, and a typewriter used by blind people. In addition, creativity was employed, and a reel was used to form the relief in the characters' images. This construction was developed jointly with sighted students.

Another example is the Drummath Project, created by Mathias (2010), entitled *Mathematics Education for the Visually Impaired: A Proposal Using Sounds, Rhythms, and Psychomotor Activities*. This work focuses on the use of the senses and is the result of a project that began between 1999 and 2000 at the Benjamin Constant Institute. It presents questions to aid in the understanding of certain concepts involving sounds, rhythms, and psychomotor activities.

In view of the aforementioned, it is evident that the educational landscape has undergone changes in recent years, which have led to a movement within schools and higher education institutions in favor of inclusion. Furthermore, this situation can create a vicious cycle, as higher education teachers also lack the necessary training to address issues related to inclusion.

The studies analyzed show a movement toward trends in mathematics education. Perspectives such as the exploration of touch in the use of teaching materials and Braille are highlighted, as is the importance of using technology. That said, it is worth noting that it is important to understand what people with disabilities want, because even with a variety of studies showing the relevance of these approaches, there are still those who identify with more traditional proposals.

Although the studies analyzed emphasize the use of teaching resources in the process of teaching and learning mathematics, there are students who prefer to use readers, with or without the use of technology, or other media that enable access to content or information, due to difficulties with Braille (Peixoto; Góes; Bitencourt, 2019).

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3 Methodology

This study is based on research related to inclusion and visual impairment, as well as ongoing doctoral research. In both cases, we were motivated by the fragility of the teaching-learning process in schools, due to the lack of initial and continuing training in inclusive mathematics education, which drives us or has driven us.

To conduct this research, we adopted a qualitative approach, which is characterized by working "with the universe of meanings, motives, aspirations, beliefs, values, and attitudes [...] that cannot be reduced to the operationalization of variables" (Minayo, 2007, p. 21).

In this context, Minayo (2009, p. 21) points out that:

> [...] qualitative research answers questions relating to a set of human phenomena understood here as part of social reality, since human beings are distinguished not only by their actions, but also by their thinking about what they do and by interpreting their actions within and based on the reality they experience and share with their fellow human beings.

Taking this line of inquiry, the research is bibliographic in nature, since this approach puts the researcher in direct contact with materials already written on the subject, allowing for the construction of a well-founded theoretical basis and verification of the accuracy of the information obtained (Prodanov; Freitas, 2013).

To guide this process, we used elements from the Literature Review, according to Hohendorff (2014). According to the author, this type of review consists of a "critical evaluation of materials that have already been published, considering the progress of research on the topic addressed" (Hohendorff, 2014, p. 40).

From this perspective, based on the selected texts, "[...] the authors define and clarify a specific problem, summarize previous studies, and inform readers about the current state of a particular area of research" (Hohendorff, 2014, p. 40). Based on the Literature Review, we sought to provide an overview of master's and doctoral research

conducted between 2015 and 2023, the period following the completion of Moura's (2015) latest research, carried out as part of his master's degree.

To collect research data, we conducted a search in the Brazilian Digital Library of Theses and Dissertations (BDTD) using the advanced search mode and previously defined descriptors. These were chosen based on academic publications that address mathematics education/inclusive mathematics education, visual impairment, and the training of mathematics teachers.

For data analysis, we adopted the interpretive perspective proposed by Stake (2011), based on the description of relevant and characteristic aspects of the data. It is important to note that our analysis scenario comprises discussions on "Visual Impairment," "Teacher Training," and "Mathematics Education" in the selected studies. Based on these, we seek to define and understand how the issue is problematized and what perspectives for action are envisaged.

Table 1 presents the descriptors used (d1 and d2), followed by the number of studies reported.

Table 1 – Research descriptors

Descriptor	Description	Number of results
d1	"Mathematics Education" **AND** "Visual Impairment" **AND** "Mathematics Teacher Training"	39 studies
d2	"Inclusive Mathematics Education" **AND** "Visual Impairment" **AND** "Mathematics Teacher Training"	36 studies

Source: Prepared by the authors (2025).

In order to refine the results, it was necessary to adopt inclusion and exclusion criteria for the studies reported in the research. Thus, the following selection criteria were adopted:

(1) Research papers that present practical activities – **excluding** review papers;

(2) Publication in Portuguese – **excluding** those published in other languages;

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(3) Work related to teacher training with an emphasis on teaching mathematics to students with visual impairments – **excluding** work developed with other disabilities in the context of teacher training.

In d1, we found 39 papers, and after analyzing and reading the abstracts, 11 were selected. In d2, out of 39 papers, after analyzing and reading the abstracts, 11 were also selected. Based on this selection, we compared the works to identify repeated research, leaving eight studies, which were named D1 to D7 (the dissertations) and T1 (the thesis).

The dissertations were designated by the letter D, and the numbers 1 to 7 are for organizational purposes only. For the thesis, we used the letter T, and as only one was found, it was designated T1. The following table shows the selected research studies.

Table 2 – Dissertations and theses selected after searches

Code	Author	Title	Year
D1	Edinéia Terezinha de Jesus Miranda	O aluno cego no contexto da inclusão escolar: desafios no processo de ensino e de aprendizagem de matemática (Blind students in the context of school inclusion: challenges in the teaching and learning of mathematics).	2016
D2	Marileny Aparecida Martins	Saberes docentes e ensino de matemática para alunos com deficiência visual: contribuições de um curso de extensão (Teaching knowledge and mathematics education for students with visual impairments: contributions from an extension course).	2017
D3	Ana Mara Coelho da Silva	Concepções e práticas pedagógicas acerca da construção do número voltados para a educação de alunos com deficiência visual (Pedagogical concepts and practices regarding number construction focused on the education of students with visual impairments).	2019
D4	Eliziane de Fátima Alvaristo	Uma ferramenta para elaboração de conceitos matemáticos para estudantes com deficiência visual: gráfico em *pizza* adaptado (A tool for developing mathematical concepts for visually impaired students: adapted pie chart).	2019

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D5	Angélica Silva de Sousa	Saberes teóricos e práticos no ensino de matemática para pessoas com deficiência visual (Theoretical and practical knowledge in teaching mathematics to people with visual impairments).	2021
D6	Valéria Belissa Pasuch	Narrativas de professoras que atuam no contexto da educação matemática inclusiva para estudantes com deficiência visual (Narratives from teachers working in the context of inclusive mathematics education for students with visual impairments).	2022
D7	Larisse Lorrane Monteiro Moraes	Aplicação do multiplano como alternativa metodológica no ensino das quatro operações fundamentais para alunos com deficiência visual (Application of the multiplan as a methodological alternative in teaching the four fundamental operations to students with visual impairments).	2023
T1	Eliziane de Fátima Alvaristo	Tecnologia Assistiva 3M: material manipulável de multiplicação para aprendizagem do conceito matemático ao estudante cego na perspectiva inclusiva (3M Assistive Technology: manipulable multiplication material for teaching mathematical concepts to blind students from an inclusive perspective).	2023

Source: Prepared by the authors (2025).

In **D1**, Miranda (2016) presented an understanding of the conditions that are in place for the inclusion of visually impaired students in schools, emphasizing the conditions necessary for blind students to participate and have a favorable mathematics teaching and learning process. Methodologically, this is a qualitative study with an ethnographic approach, using a double case study.

In **D2**, Martins (2017) conducted qualitative research in the field of teacher training for inclusive mathematics education. The objective was to analyze the possible mobilization of teaching knowledge associated with teaching mathematics to visually impaired students by trainee and qualified teachers through participation in an extension course. The theoretical basis involved studies on teaching knowledge, inclusion, and teaching

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mathematics to people with visual impairments. The participants were teachers, future teachers, monitors, and sign language interpreters.

In the **D3** study, the research focused on the concepts and practices regarding pedagogical practices in the construction of the notion of numbers, implemented by teachers in the Pedagogical Intervention sector of a hub institution that serves students with visual impairments. In this study, Silva (2019) bases the research on Piaget's epistemological approach. It is a qualitative study, using an action research approach, conducted with seven participants: two teachers and five visually impaired students who attend the educational environment.

Following on from this, in **D4**, Alvaristo's (2019) research sought to develop Manipulative Teaching Materials (MDM) for creating bar charts or pie charts for visually impaired students. It is also characterized as qualitative research, being a case study. The field of research was an elementary school specializing in special education for people with visual impairments, located in a municipality in the interior of the state of Paraná. The participants in the study were two visually impaired students and the teacher responsible for them. As for the material developed, improvements and adjustments were made as necessary.

The **D5** study used a qualitative approach, based on a literature review of scientific papers, enabling the creation of a meta-analysis based on the contrast between independent investigations. To this end, Sousa (2021) analyzed the historical dimensions and teaching of mathematics in Brazil, the inclusion of people with disabilities in society and education, teaching procedures, teaching practice, and continuing education.

The **D6** study, conducted by Pasuch (2022), aimed to "understand, from the perspective of mathematics teachers, how manipulative materials accessible to blind or low-vision students make it possible to conduct inclusive classes." To this end, narrative interviews were used as a data collection method (Schütze, 2013), with six participants: three mathematics teachers, two teachers (teachers who accompany classes with PAEE students in all lessons), and one Specialized Educational Services teacher. All teachers

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work with two blind eighth-grade students from a municipal school in Erechim, Rio Grande do Sul; in addition, one of the students also has an intellectual disability.

In the same vein, research **D7** focuses on the use of manipulable materials, in this case the Multiplan, for teaching the four operations in an inclusive approach. In this study, Moraes (2023) aims to investigate the learning of students with low vision. It is a qualitative study, classified methodologically as a case study. In addition to the manipulation of material, the study presents Problem Solving, according to Polya (1995), as its methodological basis.

Finally, we have thesis **T1**, in which Alvaristo (2023) outlined the objective of analyzing the contributions of 3M Assistive Technology: Manipulable Multiplication Material, to the learning of mathematical concepts by blind students, from an inclusive perspective. It takes a qualitative methodological approach, guided by action research. It was carried out in a municipal school for early childhood and elementary education, located in a city in the state of Paraná. The research subjects were a blind student enrolled in the 3rd year of elementary school, who participated in the Multifunctional Resource Room (SRM) (Type II) during after-school hours, and three teachers responsible for teaching mathematics.

Given the highlights presented, the selected and analyzed works help us to construct a scenario of the research carried out on visual impairment. In this context, we can highlight that the research, to some extent, demarcates two areas of discussion. Some studies emphasize different issues that arise in discussions about the inclusion of students with visual impairments, particularly in the context of initial and continuing teacher training.

Another aspect, which is more prevalent, focuses on the issue of adaptation in favor of a teaching and learning process for this audience. At the same time, it seeks to understand the impacts of different resources on the learning of students with visual impairments.

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4 Results and discussion

Throughout this research, we have demonstrated the importance of initial and continuing training for mathematics teachers from an inclusive perspective, as required by law and highlighted by a need that has been present in schools in recent years and has been evidenced in research. Due to the diversity present in our classrooms and the lack of equity in the teaching and learning process for students with and without disabilities, these discussions need to be further explored and problematized.

In our study, we point out this process more specifically for research focused on the visually impaired audience. Searches conducted on the BDTD platform yielded eight studies between 2015 and 2023, designated D1 to D7 and T1, comprising seven dissertations and one thesis. Based on the analysis carried out in the research summary, we identified some noteworthy approaches.

Table 3 – Research discussion groups

Research	Approaches
D2 and D3	Initial and continuing training
D1, D5, D6, D7 and D8	Classroom practices
D3, D5 and T1	Production and analysis of teaching materials

Source: Prepared by the authors (2025).

Based on the analysis of the surveys, we have created Table 3, which outlines the study areas that were identified. D2 and D3 are included in the “Initial and continuing training” area. In both studies, the focus was on mathematics teacher training from an inclusive perspective with visually impaired students.

The first was a training course, and the audience consisted of trainee teachers and qualified teachers, including the interpreter from the school in question. The meetings were held based on the exploration of materials and activities developed by the researcher on

geometry and fractions. Wearing blindfolds, the research subjects explored activities aimed at identifying and reflecting on their teaching practices with visually impaired students, as well as their conceptions of inclusion.

As for D3, training took place from the perspective of reflecting on the teaching and learning process. It was not actually a course, but rather moments of observation and interviews with teachers and mothers. In addition, classes were observed in the classroom and in the multifunctional resource room. These moments sparked the researcher's interest in mobilizing strategies for teachers' practice, as well as revealing difficulties that students had in understanding the content.

With this in mind, dynamic activities were carried out to encourage everyone involved, from teachers and classmates to resource room assistants, to contribute to the effective teaching and learning process for students with visual impairments. In this research, the activities developed were focused on constructing problem situations involving number concepts, using adaptation and manipulation as a strategy.

In the section "Classroom practices," we have gathered works that, directly or indirectly, focus on practices that should be used in the scenario in question. For example, in D1, Miranda (2016) conducted research that spanned the teaching and learning context, seeking to understand the inclusive process from the perspective of teachers, based on interviews; of students, through observation in the school environment; and also sought to understand the approach from a family perspective, interviewing mothers.

Thus, the author reported the difficulties faced by visually impaired students (Laura and Carlos) in regular classrooms when learning the following mathematics content: First Degree Functions (Laura) and Equation Systems (Carlos). Based on this study, it can be identified that practices involving the manipulation of teaching materials and the use of assistive technology are necessary in the process of inclusive teaching with visually impaired students. Communication during class, when the teacher writes information on the blackboard and transmits it to blind students, must also be rethought.

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In D5, practices were highlighted based on a bibliographic review in which teaching knowledge was highlighted for teaching practice in inclusive classes with visually impaired students. Thus, highlighting the use of manipulation, assistive technologies, and Braille.

In D6, based on narratives with teachers, the importance of practices focused on the use of manipulation for the education of students with visual impairments was highlighted. In this scenario, Pasuch (2022, p. 113) states "that the potential of manipulative materials and games as a resource used by participating teachers is basically Braille writing."

The other core discussion incorporates works focused on "Production and analysis of teaching materials." Here, we highlight research in which manipulative teaching materials were developed and/or used.

In D4, an MDM was developed for creating bar charts and pie charts for visually impaired students. Through this process, points were identified that needed to be modified in the material, such as the type of material used for construction and the activities explored. These points were refined until they reached the ideal point for use.

In the same vein, in T1, the author developed her thesis based on 3M Assistive Technology: Manipulative Multiplication Material (TA–3M)[1] for teaching the concept of multiplication tables to blind students from an inclusive perspective. The author followed the same trend used in her first research and developed strategies for inclusive classrooms with visually impaired students.

Similarly, in terms of the use of materials, in D7, the researcher used an existing MDM, the multiplane, and explored it for learning the four operations with a teacher and a student with low vision from the 5th grade of elementary school at a public elementary school located in the municipality of Moju/PA. This proposal was theoretically based on Polya's studies on problem solving.

[1] The resulting material has been deposited with the National Institute of Industrial Property (INPI).

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Based on this study, we noticed that there are some common points regarding research focused on the teaching-learning process with visually impaired students. From the selection of keywords in the texts, we constructed the following word cloud:

Figure 1 – Keyword cloud of the analyzed works

Source: Prepared by the authors (2025).

Around the three keywords that are at the center: “mathematics teaching,” “visual impairment,” and “inclusive education,” inclusive mathematics education emerges as a new field with increasingly strong theoretical foundations. Practices and methodologies that contribute to this process are also highlighted, especially assistive technology, manipulable materials, and teacher training – a term emphasized in most of the studies. When training does not appear as the main focus, it is still highlighted in the discourse.

5 Conclusions

Following the publication of Moura (2015), in which we investigated the mobilization of teaching knowledge among teachers who taught visually impaired students in regular classrooms, it became clear, as early as 2015, that these teachers lacked preparation. In this article, a mapping was carried out in the BDTD database of dissertations

and theses in order to verify academic publications from 2015 to 2023 that focused on the inclusive process with visually impaired students.

From this, we found that, in this eight-year period, only eight studies were published that included the descriptors used in the survey of publications. It should be noted that, during this period, there were changes in paradigms, concepts, and legal advances. However, upon analyzing the research, we noticed that it focuses on three perspectives: use or adaptation of materials; investigation of what happens in practice in the school environment; and actions taken in initial and continuing teacher training.

Given these findings, questions arise that are necessary for the development of future research: what does this result reveal to us, researchers and teachers? Despite a broader debate on the inclusion of students with disabilities, the research conducted addresses related perspectives, but lacks depth. Thus, we believe that research related to initial teacher training constitutes a vast field to be explored.

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