

Formative needs of LIBRAS teachers for the Mathematics course: challenges for implementing inclusive practices in the classroom¹

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ABSTRACT

The education of Mathematics teachers to work with deaf students requires attention to multiple formative needs, including proficiency in LIBRAS (Brazilian Sign Language), the design of meaningful activities, the guidance of student work, and effective assessment. The practice of LIBRAS in the classroom presents challenges for both pre-service and in-service teachers, especially given the complexity of mathematical language and the need for specific communication. Studies indicate that the lack of qualified professionals' compromises inclusion, highlighting gaps between theory and practice. Assessing teachers' learning in LIBRAS is essential to identify deficiencies, guide formative interventions, and improve instructional mediation. Furthermore, the development of strategies that integrate theory and practice promotes meaningful learning and ensures the full participation of deaf students. Strengthening these competencies contributes to an inclusive, critical, and high-quality pedagogical practice.

KEYWORDS: LIBRAS. Mathematics. Inclusion. Teacher formation.

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Necessidades formativas de professores de LIBRAS para o curso de Matemática: desafios para a implementação de uma prática inclusiva em sala de aula

RESUMO

A formação de professores de Matemática para atuar com estudantes surdos demanda atenção a múltiplas necessidades formativas, incluindo o domínio da LIBRAS, a elaboração de atividades significativas, a condução do trabalho dos alunos e a avaliação efetiva. A prática da LIBRAS em sala de aula apresenta desafios, tanto para docentes em formação quanto para professores regentes, especialmente diante da complexidade da linguagem matemática e da necessidade de comunicação específica. Estudos indicam que a carência de profissionais qualificados compromete a inclusão, evidenciando lacunas entre teoria e prática. A avaliação do aprendizado dos professores em LIBRAS é fundamental para identificar defasagens, orientar intervenções formativas e aprimorar a mediação do ensino. Além disso, o desenvolvimento de estratégias que integrem teoria e prática favorece a aprendizagem significativa e promove a participação plena dos alunos surdos. O fortalecimento dessas competências contribui para uma prática pedagógica inclusiva, crítica e de qualidade.

PALAVRAS-CHAVE: LIBRAS. Matemática. Inclusão. Formação de Professores.

Necesidades formativas de los docentes de LIBRAS en los cursos de Matemáticas: Desafíos para la implementación de prácticas inclusivas en el aula

RESUMEN

La formación de los docentes de Matemáticas para trabajar con estudiantes sordos requiere atención a múltiples necesidades formativas, incluyendo el dominio de la LIBRAS, la elaboración de actividades significativas, la orientación del trabajo de los alumnos y la evaluación efectiva. La práctica de la LIBRAS en el aula presenta desafíos tanto para docentes en formación como para docentes en ejercicio, especialmente dada la complejidad del lenguaje matemático y la necesidad de comunicación específica. Los estudios indican que la falta de profesionales calificados

compromete la inclusión, evidenciando brechas entre teoría y práctica. La evaluación del aprendizaje de los docentes en LIBRAS es esencial para identificar deficiencias, orientar intervenciones formativas y mejorar la mediación pedagógica. Además, el desarrollo de estrategias que integren teoría y práctica favorece un aprendizaje significativo y asegura la participación plena de los estudiantes sordos, contribuyendo a una práctica pedagógica inclusiva, crítica y de calidad.

PALABRAS CLAVE: LIBRAS. Matemática. Inclusión. Formación docente.

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Introduction

The process of teacher education, considering current educational paradigms, requires profound revision, especially in the face of social, technological, and pedagogical transformations that challenge teaching practice. Particularly in Mathematics teaching, the demands that articulate theory and practice become even more challenging, as the area requires the precise communication of abstract concepts, the development of logical reasoning, and the application of specific procedures.

For the education of deaf students to be truly inclusive, it becomes indispensable to use visual resources and an acceptable level of fluency in LIBRAS. In this scenario, understanding the formative needs of Mathematics teachers in this language is fundamental to overcoming communication barriers and consolidating a genuinely inclusive pedagogical practice.

In this sense, the consolidation of inclusive education, even supported by Law No. 10,436/2002, which recognizes the Brazilian Sign Language (LIBRAS) as a means of communication and expression for the deaf community, and by Decree No. 5,626/2005, which regulates its teaching, has generated increasingly complex demands for teacher education. Within the specific scope of Mathematics teacher education, formative needs related to

the mastery and use of LIBRAS are evident. However, challenges persist that hinder the implementation of inclusive practices in the daily classroom.

The teaching of LIBRAS in teacher education courses presents challenges and possibilities. Paiva, Faria, and Chaveiro (2018) observe that, although Brazilian legislation makes this discipline mandatory, discussions persist regarding the definition of its workload and the contents covered, which highlights gaps in the qualitative implementation of LIBRAS teaching in undergraduate courses. For the authors:

[...] the impossibility of students becoming fluent in the language by taking only one semester of the subject is indisputable. If this is the case, why not then take the opportunity to introduce the Deaf Subject to future teachers? We believe that they will be better prepared to deal with deaf students in the inclusive classroom if they understand who they are, how they learn, how they communicate, what the main records in the history of deaf education are, among other aspects (Paiva, Faria, and Chaveiro, 2018, p. 7).

Indeed, knowing the deaf subject is fundamental for the development of the subject. However, taking only one semester of LIBRAS does not guarantee fluency in the language, although it may spark interest in deepening knowledge about the deaf community and its forms of communication. This process, however, can be viewed with apprehension by some pre-service teachers, either due to a lack of skills or a lack of interest in learning a new language.

In this context, it becomes necessary to point out some formative needs in LIBRAS for future Mathematics teachers, understanding that it is a complex and relevant process that requires the articulation between theory and practice within the classroom space.

The Practice of LIBRAS in the Teaching Context: Reports from Mathematics Teachers on Classroom Challenges

The practice of the Brazilian Sign Language (LIBRAS) in the context of Mathematics teaching constitutes a challenge for both pre-service and in-service teachers. Below is a sample from a study conducted with teachers from the Mathematics and Physics areas of the state public network in Araguaína – Tocantins, in which the main challenges faced by teachers working in inclusive classes were identified. The notes, extracted from Anjo, Silva, and Carneiro (2021, p. 10), are listed below, with each letter corresponding to a participating teacher:

A - Pace of the content, which must be slower due to their difficulty in following the class.

B - Lack of follow-up in the early grades; parental presence in activities; adequate materials for each activity.

D - Lack of qualified professionals; lack of qualification on the part of government officials; absence of methodological resources.

F - Lack of knowledge of the multiplication tables; difficulty in interpreting, sometimes in reading, understanding, etc.

H - Absence of production of adapted material for the student.

It is important to emphasize that some of these teachers completed their initial education before, and others after, the promulgation of Decree No. 5,626/2005, which regulates the inclusion of LIBRAS as a mandatory discipline in undergraduate courses. Half of the participants took LIBRAS during their initial education, while the other half did not have access to the discipline but participated in LIBRAS courses offered by the schools themselves. Despite this initial contact, all reported difficulties in teaching Mathematics to deaf students. In the presented reports, it is evident that the absence of qualified professionals compromises the realization of inclusion in the classroom.

The reported challenges demonstrate that the lack of qualified professionals compromises the realization of inclusion in classrooms with deaf students. Furthermore, a gap is observed between theory and practice in teaching Mathematics to this audience. This scenario can be explained by the fact that the inclusion of LIBRAS in teacher education curricula is relatively recent, with just over two decades. In the specific case of Mathematics, the complexity of the content is compounded by the existence of a specific language, composed of signs and symbols, whose understanding requires logical-deductive reasoning and more dynamic communicative strategies.

Given this, the present study proposes to enunciate suggestions so that LIBRAS teachers, when acting in the discipline within the mathematics course, can improve practices and content, and not merely comply with legislation, but promote effective integration between theory and practice, contributing to a consistent and high-quality inclusive process.

The methodological path adopted for obtaining the information was based on bibliographic and documentary research, with a qualitative approach. The sources consulted included institutional documents and specific legislation. Bibliographic research allowed for the analysis of knowledge already produced in the area, enabling an understanding of theories related to teaching Mathematics to deaf students. In turn, documentary research focused on analyzing the formative needs of Science and Mathematics teachers, especially regarding the insertion of LIBRAS and inclusive practices in the curriculum.

From the Formative Needs of LIBRAS Teachers to Demands in Mathematics: A Parallel

Teacher education should be conceived based on frameworks that overcome traditional and fragmented models. In this sense, Carvalho and Gil-Pérez (2011) propose some formative needs that are fundamental for the constitution of teacher identity: from overcoming spontaneous conceptions

about teaching and learning to the need to know how to organize and manage the educational process in its complexity.

Considering the information presented by the authors, it is possible to draw a parallel between what should be considered in a LIBRAS course for the undergraduate education of any teaching degree, especially Mathematics. In the realm of sciences, as stated by the authors, formative needs should encompass both theoretical and practical aspects, involving critical reflection on pedagogical practice, scientific and didactic updating, collaborative work, social commitment, and innovation capacity.

In this sense, considering LIBRAS in initial education based on these dimensions constitutes an essential development so that future teachers develop specific competencies capable of responding to contemporary demands, favoring a more critical, inclusive, and transformative teaching practice.

Carvalho and Gil-Pérez (2011) begin their reflection on formative needs by presenting the "rupture with simplistic views on Science teaching," which requires recognizing that possessing knowledge about a certain topic does not imply having all information about it. To deepen understanding, it becomes essential to resort to research, investigation, observation, and experimentation, to validate and re-signify the constructed knowledge.

In this sense, Carvalho and Gil-Pérez (2011, p. 19) emphasize that "the set of knowledge and skills now provides a rich and complex vision of teaching activity that goes beyond, in some aspects, what is usually indicated as the great objectives of teacher education." Knowledge, therefore, breaks barriers and broadens horizons.

When considering the discipline of LIBRAS, recognizing the existence of the deaf subject does not guarantee meaningful knowledge socialization capable of effectively promoting learning. It is essential to provide experiences within the deaf community so that, through experience, students become sensitized to the need to develop competencies and skills that allow them to act effectively in the face of classroom demands.

The research by Souza (2017, p. 14), in which academics were questioned, at the beginning and at the end of the semester, about "what do you understand by deaf?", indicated a significant progression in the understanding of the concept due to the disciplinary treatment offered. In this sense, it is understood that the first formative need for Mathematics teachers in the LIBRAS discipline involves the "rupture with simplistic and exclusively theoretical views of the language," highlighting the importance of practice through coexistence that goes beyond the limits of the classroom.

The second formative need in Carvalho and Gil-Pérez (2011) is "to know the subject matter to be taught." The authors pose the following question: what does the pre-service teacher need to 'know' to effectively 'know how to do' in science teaching? Initially, it is essential that they master the content of the discipline they will teach, in order to conduct questions and guide reflections that result in plausible and well-founded answers.

Analogously, one should reflect on LIBRAS for Mathematics teachers: 'What do LIBRAS teachers need to know to teach future Mathematics teachers how to communicate effectively regarding content with deaf students in their classes?' The answer to this question cannot be restricted merely to communication through signs related to everyday situations, as if this were the limit of what can be taught in one semester.

It is essential that LIBRAS teachers teach future Mathematics teachers specific signs linked to the content and themes inherent to the area of education. "This leads us to question: 'what would be the sign that represents "function" in Mathematics?' or, furthermore, what would be the signs corresponding to terms such as 'vectors', 'scalars', 'matrices', among others.

The third formative need stated by the authors refers to "questioning teachers' 'common sense' ideas about the teaching and learning of Sciences." Regarding Science teaching, all teachers carry with them a set of knowledge derived from common sense. This dimension of education is especially

relevant in the context of the so-called 'society of haste,' in which time to experience daily events reflectively is increasingly limited.

Drawing a parallel, the need in LIBRAS for future Mathematics teachers consists of "breaking with the common sense that the discipline is limited to an introductory discourse on inclusion, focused only on teaching everyday signs." Considering the expansion of specific signs for content present in Mathematics can directly influence the conceptions that teachers will take to their practice, potentially impacting the learning context positively. However, for such contributions to be effective, they must be expanded and grounded based on knowledge consolidated by the field of research, which, from the perspective of studies on signs in Mathematics, is still underexplored.

The fourth formative need stated by Carvalho and Gil-Pérez (2011) refers to "acquiring theoretical knowledge about the learning of Sciences." Comparatively, we can infer that the LIBRAS teacher needs to acquire specific knowledge about signs related to the content essential for learning Mathematics.

This becomes fundamental so that communication in the classroom is effective and allows deaf students to understand abstract concepts, establish relationships between ideas, and actively participate in proposed activities. Without this preparation, there is a risk of limiting learning to the transmission of generic or everyday signs, neglecting the complexity and specificity of mathematical content. Therefore, the teacher of the LIBRAS discipline must "apply knowledge of the language in disciplinary content, ensuring an inclusive, critical pedagogical practice aligned with the learning needs of deaf students."

The fifth formative need presented by the authors is "to know how to prepare activities capable of generating effective learning." The elaboration of activities that promote meaningful learning is a central formative need for every pre-service teacher. For LIBRAS teachers, this need becomes even more relevant, as it requires practices that go beyond the traditional limits of the classroom.

By proposing activities that dialogue with the knowledge already consolidated by students, it is possible not only to deepen the understanding of concepts but also to favor the critical and inclusive restructuring of ideas. Thus, pedagogical practice in LIBRAS should combine knowledge of the language with didactic strategies that stimulate active participation and effective understanding of content, ensuring meaningful learning for all students.

The sixth need highlighted by the authors is "to know how to direct the work of the students." Given the perspective of LIBRAS applied in the context of themes related to Mathematics, it means conducting student work beyond merely proposing activities expecting unexpected or creative answers. It is about guiding the learning process in an intentional and structured manner, so that the development of skills allows, at the appropriate time, for decision-making grounded in consolidated concepts from the perspective of the language.

In this context, the teacher's ability to direct student work should assume an even more relevant role when it comes to inclusive classes, especially involving deaf students. For these students, it is not enough to merely transmit concepts; it is necessary to mediate learning through adequate communicative strategies, such as the use of LIBRAS and visual resources, ensuring that each student fully understands the content. Furthermore, continuous monitoring of individual development allows for adjusting activities and pedagogical interventions, promoting effective learning and the construction of knowledge in a critical and autonomous manner.

Finally, the last formative need, 'to know how to assess,' is indeed the most challenging. In general, the theme of assessment is still the target of constant investigations and debates, due to the subjectivity of the process, which depends on contexts, content, and subjects involved. In this sense, the ability to assess stands out as one of the most complex and challenging, generating unease in both students and teachers. This occurs because

assessment is not limited to measuring student learning but also implicitly reflects on the effectiveness of the teaching process itself.

Assessing the knowledge of Mathematics teachers in LIBRAS is fundamental to ensuring that mathematical concepts are socialized in a way that is accessible to deaf students. This assessment allows for the identification of gaps in understanding the language and in the use of specific signs for area content, enabling targeted formative interventions and the improvement of pedagogical practices. Without this monitoring, there is a risk that teaching remains superficial or limited to everyday signs, harming the effective learning of students.

Furthermore, continuous assessment of teachers' mastery of LIBRAS contributes to building a more inclusive and equitable learning environment. By understanding what teachers have learned and how they apply this knowledge in the classroom, it becomes possible to promote more effective didactic strategies, reinforce the integration between theory and practice, and ensure that all students, regardless of their linguistic conditions, have full access to mathematical concepts. In this way, assessment not only measures competencies but also guides professional development and teaching quality. In summary, it was possible to establish the following comparative framework.

FRAMEWORK 1: Comparison between the formative needs of science teachers and LIBRAS teachers for Mathematics

Formative Needs of Science Teachers	Formative Needs for LIBRAS Teachers for Mathematics Classes
Rupture with simplistic views on science teaching	Rupture with simplistic and exclusively theoretical views of the language
To know the subject matter to be taught	To know specific signs linked to the content and themes inherent to the area of education.
Questioning teachers' 'common sense' ideas about the teaching and learning of sciences	Break with the common sense that the subject is limited to an introductory discourse on inclusion, focused only on teaching everyday signs.
Acquiring theoretical knowledge about the learning of sciences	Apply knowledge of the language in disciplinary content, ensuring an inclusive, critical pedagogical practice aligned with the learning needs of deaf students.
To know how to prepare activities capable of generating effective learning	Propose activities that dialogue with the knowledge already consolidated by students, making it possible not only to deepen the understanding of concepts but also to favor the critical and inclusive restructuring of ideas.
To know how to direct the work of the students	To know how to guide the learning process in an intentional and structured manner, so that the development of skills allows, at the appropriate time, for decision-making grounded in consolidated concepts from the perspective of the language.
To know how to assess	To know how to assess Mathematics Content in LIBRAS.

Source: adapted from the book: Formação de professores de Ciências: tendências e inovações, year 2011.

Conclusão

The Brazilian Sign Language (LIBRAS) has established itself as an integral part of the Brazilian sociocultural reality, constituting not merely the learning of a new language, but an essential tool for communication between hearing people and people with hearing impairments. In the educational context, especially in Mathematics teaching, a significant formative demand is observed aimed at pre-service teachers, seeking to meet, in a qualified and effective manner, the requirements of an inclusive education.

It is imperative that the pre-service teacher receives a solid foundation of knowledge, based on scientific rigor, coupled with the stimulation of research and critical reflection. Teacher education should not be limited to the static transmission of contents but should foster the evolution of thought, allowing initial conceptions to be reformulated in light of new experiences and perspectives.

Mastery of mathematical content is essential, requiring an understanding of its historical trajectory and its conceptual bases. In Mathematics teaching mediated by LIBRAS, this mastery must be articulated in a contextualized manner, aligning mathematical concepts with an inclusive perspective. Teaching experience, validated by practice and dialogue with scientific research, should open space for questioning and for overcoming simplistic views, consolidating pedagogical practices sustained by consistent methodologies.

Pedagogical activities, in this context, should value all stages of the knowledge construction process, recognizing the importance of guiding student work, especially in classes that demand inclusive strategies. Inclusion does not mean mere integration or grouping; it implies ensuring differentiated support, with adequate resources and methodologies, guaranteeing comprehension and access to knowledge for all students.

Regarding assessment, it should not be restricted to formal instruments, such as written exams. It is a formative need widely debated in

mathematics education congresses, especially in light of the high failure rates in the discipline. For students with specific educational needs, the challenge is even greater. Assessing, therefore, also involves an exercise in teacher self-assessment, investigating causes of lack of success and redirecting pedagogical practices to promote more effective and equitable learning.

Finally, the consolidation of truly inclusive Mathematics teaching, mediated by LIBRAS, is not limited to technical mastery of the sign language. It is an ethical, social, and political commitment to educational equity, requiring from teacher education courses and public policies a continuous investment in education and the production of adequate pedagogical resources. Only in this way will it be possible to transform the right to inclusive education into a concrete reality, ensuring that access to mathematical knowledge is effective and meaningful for all students.

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