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# The Role of Teachers in Building Access to Mathematics Learning for Deaf Students in Public Elementary School

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**Abstract**

Mathematics learning in inclusive elementary schools still faces challenges in providing deaf students with meaningful access to learning, primarily due to communication barriers, the complexity of abstract mathematical language, and limited learning resources. Therefore, classroom teachers play a strategic role in ensuring access to learning by implementing strategies, communicating, and using media appropriate to deaf students' learning needs. This study aims to examine the role of classroom teachers in building access to meaningful mathematics learning for deaf students in inclusive public elementary schools. This qualitative case study was conducted at SDN Junrejo 01. Data were collected through interviews with one second-grade teacher, two second-grade deaf students (P1 and P2), and the school's inclusion coordinator. The study found that teachers build access to mathematics learning by identifying students' initial abilities, independence, and individual characteristics; using pictures, concrete objects, simple language, verbatim explanations, repetitive instructions, and tailored communication strategies; and adapting materials, assignments, and assessments to gradually build foundational concepts. These findings suggest that access to mathematics for deaf students requires classroom strategies, parental support, and school support systems. This study contributes to inclusive mathematics education by highlighting the importance of integrated support from teachers, families, media, and schools. In practice, inclusive elementary schools need to strengthen coordination among class teachers, inclusion coordinators, parents, assistant teachers, and resource room services to ensure that concrete media, communication adjustments, and learning assistance are consistently provided.

**Keywords**: Classroom Teachers, Deaf Students, Inclusive Education, Mathematics Learning Access, Public Elementary School.

**Abstrak**

Pembelajaran matematika di sekolah dasar inklusif masih menghadapi tantangan dalam menyediakan akses pembelajaran yang bermakna bagi siswa tunarungu, terutama karena hambatan komunikasi, kompleksitas bahasa matematika abstrak, dan keterbatasan sumber belajar. Oleh karena itu, guru kelas memainkan peran strategis dalam memastikan aksesibilitas pembelajaran dengan menerapkan strategi, berkomunikasi, dan menggunakan media yang sesuai dengan kebutuhan belajar siswa tunarungu. Studi ini bertujuan untuk meneliti peran guru kelas dalam membangun akses terhadap pembelajaran matematika yang bermakna bagi siswa tunarungu di sekolah dasar negeri inklusif. Studi kasus kualitatif ini dilakukan di SDN Junrejo 01. Data dikumpulkan melalui wawancara dengan satu guru kelas dua, dua siswa tunarungu kelas dua berkode P1 dan P2, serta koordinator inklusi sekolah. Penelitian ini menemukan bahwa guru

membangun akses pembelajaran matematika melalui identifikasi kemampuan awal, kemandirian, dan karakteristik individu siswa, penggunaan gambar, objek konkret, bahasa sederhana, penjelasan kata demi kata, instruksi berulang, dan strategi komunikasi yang disesuaikan serta penyesuaian materi, tugas, dan penilaian untuk membangun konsep dasar secara bertahap. Temuan tersebut menunjukkan bahwa akses matematika bagi siswa tunarungu membutuhkan strategi kelas, dukungan orang tua, dan sistem dukungan sekolah. Studi ini berkontribusi pada pendidikan matematika inklusif dengan menegaskan pentingnya dukungan terpadu dari guru, keluarga, media, dan sekolah. Secara praktis, sekolah dasar inklusif perlu memperkuat koordinasi guru kelas, koordinator inklusi, orang tua, guru pendamping, dan layanan ruang sumber agar media konkret, penyesuaian komunikasi, serta bantuan belajar dapat diberikan secara konsisten.

**Kata Kunci**: Akses Pembelajaran Matematika, Guru Kelas, Pendidikan Inklusif, Sekolah Dasar Negeri, Siswa Tunarungu.

## INTRODUCTION

Inclusive education ensures every child, regardless of ability, has equal access to quality learning in a supportive environment. Teachers play a key role in its success through their attitudes, knowledge, and readiness. Implementing inclusive teaching at all education levels creates a fair and responsive system for diverse students (Kismiati, 2025). However, the implementation of inclusive education in elementary schools still faces various structural challenges, such as limited resources, lack of teacher training, and minimal adequate policy and infrastructure support (Ediyanto et al., 2024). On the other hand, teachers' experience and exposure to students with special needs have been shown to increase positive attitudes and pedagogical competence in managing heterogeneous classes (Tsegaye et al., 2025). Challenges arise regarding academic aspects, behavior management, and communication and language needs, making ongoing training support for teachers essential (Diken et al., 2025). Therefore, strengthening teacher competencies, collaborating with various parties, and developing inclusive policies are key to creating a learning environment that is fair and responsive to student diversity in elementary schools.

The importance of access to mathematics learning for deaf students in elementary schools lies in ensuring that hearing limitations do not become a barrier to understanding the abstract concepts that underpin numeracy literacy, given that mathematics is an essential skill for solving everyday problems. Deaf students often experience gaps in mathematics achievement not because of cognitive limitations but because of a lack of access to language, visual representations, and learning strategies appropriate to their characteristics (Alifulloh et al., 2024). In addition, the use of visual approaches such as sign language, gestures, and linking mathematical concepts to real-world contexts has proven to be a key factor in improving deaf students' understanding of concepts and

learning outcomes (Horzum, 2023). Accessible learning environments, such as sign language-based bilingual models, can also reduce barriers to understanding academic content, including mathematics, and support the development of academic achievement equivalent to that of hearing students (Yiu, 2024). On the other hand, the integration of technology and specially designed digital learning resources can increase the accessibility of mathematics learning while encouraging the independence of deaf students in learning (Utami et al., 2025). Therefore, strengthening access to mathematics learning for deaf students must be achieved through inclusive, visually based learning designs and supported by social interactions and cooperative strategies.

The characteristics of learning mathematics in deaf students are closely related to limited access to language and symbolic representation, which are the main foundations in understanding numerical and procedural concepts, so that many deaf students experience delays in the development of number concepts from an early age due to minimal exposure to quantitatively rich language (Santos & Cordes, 2021). In addition, linguistic barriers significantly affect students' ability to understand mathematical story problems, as limitations in reading and interpreting language lead students to focus more on the surface aspects of the problem rather than on the in-depth mathematical reasoning (Allala, 2024). Cognitive factors such as limited working memory and difficulty connecting abstract concepts with concrete experiences contribute to the mathematics achievement gap in deaf students (Horzum, 2023). Affective aspects such as math anxiety and low self-confidence are also significant barriers, as deaf students tend to show higher levels of anxiety, which impacts their academic performance (Mishra et al., 2022). External barriers such as a lack of teacher competence in sign language, limited appropriate learning media, and minimal supporting technology exacerbate the difficulties in learning mathematics in deaf students (Basigi et al., 2024). The characteristics of these obstacles show that the difficulties in learning mathematics among deaf students are multidimensional, encompassing linguistic, cognitive, affective, and learning-environment aspects.

The role of the class teacher in mathematics learning in inclusive classes is crucial as the main facilitator who connects diverse learning needs with adaptive pedagogical strategies, where the teacher not only plays a role as a material deliverer, but also as a designer of differentiated learning who can adjust the content, process, and evaluation according to the characteristics of students with special needs and regular students (Makrof & Mahmud, 2025). In mathematics education, class teachers are also responsible for compiling and implementing individual learning programs and conducting ongoing

monitoring and evaluation. However, in practice, there are still limitations in the availability of adequate resources and evaluation competencies (Filiz, 2023). In addition, classroom teachers play an important role in implementing inclusive learning strategies, such as differentiation, technology use, and collaborative approaches, to ensure that all students can access mathematical concepts effectively (Abdulah et al., 2025). Teachers must also be able to manage students' cognitive load by designing structured learning that does not overburden cognitive capacity, thereby enabling students with diverse abilities to understand mathematical concepts effectively (Banerjee & Gautam, 2024). The role of teachers is also evolving as facilitators of social interactions and collaborative learning, encouraging active student participation through strategies such as collaborative problem-solving, which have been shown to increase inclusivity and engagement in learning mathematics (Ferguson-Patrick & Liebech-Lien, 2025).

Based on interviews with the inclusion coordinator, SDN Junrejo 01 Public Elementary School was selected as the case site because it has implemented inclusive education practices in both classroom learning and school support services. The school served 25 students with special needs. Inclusive services at this school were provided through three models: full learning with the classroom teacher, mentoring by shadow teachers or parents, and pull-out services in the resource room for students who required more intensive support. The school also provided several accessibility facilities, including ramps, handrails, accessible toilets, a resource room, a sensory-motor room, and a relaxation room. These conditions indicate that this school is a relevant case site for examining how classroom teachers build access to mathematics learning for deaf students in an inclusive public elementary school. Interviews with the second-grade classroom teacher showed that mathematics learning for deaf students in inclusive classrooms faces complex challenges. The classroom teacher is a transmitter and a designer of access to learning through language adjustment, selection of visual media and concrete objects, repetition of explanations, modification of assignments and assessments, and collaboration with parents and school support services. The classroom teacher is closest to the daily learning dynamics of deaf students, so the success of access to mathematics education is largely determined by the teacher's sensitivity to students' individual needs.

Based on this description, the main problem in mathematics learning for deaf students in public elementary schools lies not only in hearing limitations, but also in how classroom teachers build access to mathematical language, symbols, instructions, interactions, and meaningful learning experiences. Therefore, this research focuses on the

role of classroom teachers in building access to mathematics learning for deaf students in public elementary schools. Specifically, this research addresses three research questions, including: How do classroom teachers identify the mathematics learning needs of deaf students in inclusive elementary classrooms? What strategies and learning adaptations do classroom teachers use to build access to mathematics learning for deaf students? And what barriers and supports influence classroom teachers in building access to mathematics learning for deaf students?

## RESEARCH METHODS

This research used a qualitative approach with a single-case study design. The qualitative approach was chosen because this study aims to gain an in-depth understanding of how classroom teachers build access to mathematics learning for deaf students in inclusive public elementary schools, including how classroom teachers identify the mathematics learning needs of deaf students in inclusive elementary school classes, what learning strategies and adaptations classroom teachers use to build access to mathematics learning for deaf students, and what obstacles and supports influence classroom teachers in building access to mathematics learning for deaf students. The case study design was considered appropriate because the research focused on a contemporary educational phenomenon in a real-life classroom context, namely, the role of classroom teachers in providing accessible mathematics instruction for deaf students. In line with Yin (2018), case study research is suitable when a study investigates a contemporary phenomenon in depth within its real-world context, especially when the boundaries between the phenomenon and the context are not clearly separated.

The case in this research concerned mathematics learning for deaf students in Grade II at SDN Junrejo 01 in East Java. This school was selected purposively because it is a public elementary school that implements inclusive education and has deaf students participating in regular classroom learning. In this case, the boundaries were established by the school context, the second-grade classroom, the mathematics learning process, and the role of classroom teachers in facilitating access to deaf students' learning. The learning difficulties of deaf students were not the only problem in this case, but also served as a lens for examining how classroom teachers identified learning needs, adapted mathematical explanations, used visual and concrete media, modified tasks and assessments, and collaborated with school support services.

Purposive sampling was used to select informants who were directly involved in the case. The informants consisted of one second-grade classroom teacher, two deaf second-grade students (P1 and P2), and one inclusion coordinator. The classroom teacher was chosen because planning, teaching, and evaluating mathematics instruction were direct responsibilities of the classroom teacher in the inclusive classroom. The two deaf students were selected because they were the primary participants in accessing mathematics instruction in the classroom. The inclusion coordinator was selected because this informant had information about the school's inclusive education services, including mentoring, pull-out services, resource room support, learning modifications, and support for students with special needs. Thus, the number of informants was not determined by statistical representation but by their relevance, direct experience, and capacity to provide in-depth information about the case.

Data were collected mainly through semi-structured interviews. This technique was used because it allowed the researchers to explore participants' experiences, views, and practices in depth while remaining focused on the research questions. Interviews with the classroom teacher explored students' learning needs, mathematics learning strategies, communication adjustments, learning media, task modification, assessment adaptation, and obstacles in teaching deaf students. Interviews with deaf students explored their experiences understanding mathematics, the types of assistance they found helpful, and the difficulties they encountered in learning. The interview with the inclusion coordinator explored the school's inclusive education system, support services, learning modifications, and institutional support for students with special needs. To strengthen the case study evidence, this research employed multiple sources through source triangulation.

Following the case study inquiry principle proposed by Yin (2018), evidence was compared among informants involved in the same case, namely the classroom teacher, deaf students, and the inclusion coordinator. This comparison helped the researchers examine the consistency of information about students' learning needs, classroom strategies, communication adjustments, learning media, and school support services. Member checking was also conducted by reconfirming the main meanings of the interview data with the informants to ensure that the researchers' interpretations were accurate. Data were analyzed qualitatively through several stages. First, the researchers organized the interview data by informant. Second, the data were read repeatedly to identify meaningful statements related to the research focus. Third, the researchers coded the data based on key issues, including students' initial abilities, independence, use of pictures, concrete objects,

simplified language, word-for-word explanations, repeated instructions, adapted communication, task modification, assessment adjustment, parental support, resource room services, and learning barriers. Fourth, similar codes were grouped into categories. Fifth, the categories were developed into themes that represented the role of classroom teachers in building access to mathematics learning for deaf students. The final themes included the identification of mathematics learning needs, classroom teachers' strategies, the adaptation of mathematics learning, and barriers and supports in building access to learning. This analytical procedure is consistent with qualitative case study analysis, which emphasizes systematic organization, coding, categorization, and interpretation of data to produce meaningful and accountable findings.

## RESULTS AND DISCUSSION

### Results

Data for this study were collected through semi-structured interviews with one second-grade classroom teacher, two deaf students, and the inclusion coordinator at SDN Junrejo 01. The data were coded and categorized to answer the research questions about how classroom teachers facilitate access to mathematics learning for deaf students in inclusive classrooms. Based on the data analysis, the results are presented in three themes: identification of the mathematics learning needs of deaf students; classroom teacher strategies and learning adaptations for building access to mathematics learning; and barriers and supports for building access to mathematics learning.

#### *Identification of Mathematics Learning Needs of Deaf Students*

The interview results show that the classroom teacher identified the mathematics learning needs of deaf students through an early approach to students, observation of their responses to different teaching strategies, and communication with parents. The teacher explained that she tried to understand which strategies were easier for the students to follow before deciding how mathematics instruction should be delivered. This process was carried out not only during classroom teaching but also through communication with parents to ensure that the learning approach used at school could be continued at home. The teacher considered this communication important because differing approaches at school and at home could confuse students as they learn mathematics.

Also, the teacher's identification of the learning needs was based on the differences between the two deaf students in the classroom. The teacher noted that P1's hearing problem was less severe than P2's, and that he was more self-reliant in learning, as he

could still imitate words by observing the teacher's lip movements. P2, on the other hand, required more concrete help, a slower explanation, short sentences, less surrounding noise, and other visual support, such as lip movement and hand gestures. This finding shows that the teacher did not consider both students to be at the same learning level, but rather recognized each student's needs in relation to their actual abilities, responses to communication, and level of independence.

The students' answers to the questions during the interview also showed that their learning needs were associated with concrete assistance and repeated explanation. Asked if they liked mathematics, the students responded that they did, particularly addition. They also reported that the teacher's use of objects made mathematics easier to understand. If they did not comprehend the lesson, they would generally ask the teacher, who would repeat it for them. These responses show that deaf students needed accessible learning support in the form of concrete media, teacher assistance, and re-explanation.

From the school's perspective, the inclusion coordinator explained that teachers in inclusive classes generally made modifications for students with special needs. The coordinator stated that classroom learning was conducted in different ways depending on the students' conditions, even though the general learning process from grade one to grade six followed the same school structure. In practice, students with special needs could receive support from classroom teachers, shadow teachers, interns, or parents, depending on the availability of support in the classroom. That shows that identifying learning needs was part of a broader, inclusive school service system.

***Classroom Teacher Strategies in Building Access to Mathematics Learning***

The classroom teacher used visual and concrete strategies to build access to mathematics learning for deaf students. The teacher stated that the media most often used in mathematics instruction were pictures. She also explained that pictures were used while she pronounced words with emphasis, so that students could follow the movement of her lips. This strategy helped the students connect visual information, teacher speech, and mathematical meaning during the learning process. Along with images, the teacher also emphasized the importance of visual language, concrete objects, and demonstrations in the learning process of mathematics. The teacher feels that these forms of support were particularly valuable, as deaf students may become confused if too many words are written on the board. So, the teacher attempted to reduce reliance on written words and make it more visual and concrete. This finding reveals that the form of instruction for mathematics learning shifted from mostly verbal explanations to more visible, tangible representations.

The teacher also used strategies tailored to the students' hearing and language abilities. The teacher stood facing the student when talking to P2, spoke more slowly but naturally, used short phrases, reduced classroom noise, and provided visual cues through lip movements or hand gestures. The gestures the teacher used were not formal sign language but served as support in the classroom, helping the student understand the teacher's explanation. The strategy suggests that access to learning was shaped not just by media but also by the manner of teacher communication. The students' responses supported the usefulness of these strategies. The students stated that they understood mathematics more easily when objects were used. They also mentioned that when they did not understand the lesson, they asked the teacher, who explained the material again.

That shows that from the students' perspective, concrete objects and repeated explanations were the most meaningful forms of assistance in mathematics learning. The inclusion coordinator's data also showed that classroom strategies in inclusive learning were supported by additional assistance when available. The coordinator explained that shadow teachers helped translate or re-explain the teacher's instructions to students with special needs. In the school's inclusive service system, students could learn fully with the classroom teacher, receive mentoring from a shadow teacher or parent, or receive pull-out services in the resource room. These findings indicate that classroom teacher strategies were strengthened by support mechanisms within the school.

***Barriers and Supports in Building Access to Mathematics Learning***

The findings show that the classroom teacher faced several barriers in building access to mathematics learning for deaf students. The first barrier was limited instructional time. The teacher explained that it was difficult to give specific attention to deaf students because there were also students with other special needs in the same classroom. As a result, the teacher's attention had to be divided, while classroom learning time was limited and sometimes reduced by other school activities. The second barrier concerned mathematical language. The teacher noted that the difficulty with deaf students is not just that they cannot hear, but also how to make language, symbols, explanations, and classroom interactions truly accessible to them. The teacher stated that the abstract and relational terms: before, after, more than, less than, and equal to, were challenging for deaf students. This became more evident in story problems and in step-by-step directions, students had to grasp longer language structures and abstract relationships.

The third obstacle was the limited number of concrete learning media. The teacher mentioned that there was still a need for more concrete media to make the mathematics

learning process more effective for deaf students. Not always consistent, as the existing media was also used in other classes. This condition hindered the teacher from providing stable, consistent, concrete support during mathematics instruction. Despite these barriers, the classroom teacher also received support from parents, peers, and school services. The teacher explained that parents had an important role in helping students continue learning outside school. She communicated with parents and asked them to help repeat the material at home.

The teacher also stated that support from special assistance services was available through speech therapy in the resource room. In the classroom, peer interaction was also positive because regular students helped and reminded deaf students during learning activities. The inclusion coordinator confirmed that the school provided several forms of institutional support for inclusive education. The school had accessibility facilities such as ramps, handrails, accessible toilets, a resource room, a sensorimotor room, and a relaxation room. Overall, the findings indicate that interactions among teacher strategies, student needs, parental involvement, peer support, shadow teacher support, and school facilities shaped deaf students' access to mathematics learning.

## Discussion

### Identification of Mathematics Learning Needs of Deaf Students

The findings of this study indicate that the identification of the mathematics learning needs of deaf students was carried out through an individualized, contextual process. The classroom teacher did not rely on the student's disability category to identify potential needs, but rather observed each student's responses to instruction, each student's ability to follow mathematical tasks independently, and the types of assistance that would support each student's understanding of the lesson. This is significant as the two deaf pupils within the classroom had varying degrees of independence and ability to communicate. One student could follow verbal cues in lip movement, while the other needed the verbal cues broken down into shorter phrases, slowed down, and delivered face-to-face, along with extra visual cues. This is consistent with the finding that deaf learners are not a unified group for the teaching and learning of mathematics.

This individualized identification is consistent with the principle of inclusive education, which emphasizes that learning services should be based on students' actual needs rather than on general assumptions about disability. In inclusive classrooms, teachers need to recognize differences in communication access, cognitive readiness, language

development, and learning pace before determining appropriate instructional strategies. The teacher's effort to understand which strategies were easier for students to follow shows that identification was not a one-time activity, but an ongoing pedagogical process. This aligns with Moustache and Makhoba (2024), who emphasize that students with hearing loss require identification of individual needs and responsive teaching adaptations so that classroom instruction can be meaningfully accessed.

The results further highlight the strong relationship between concrete and visual access and the learning needs of deaf students in mathematics. The students reported the following: when the teacher used objects in maths, learning became easier, and when they did not understand the lesson, they would ask the teacher to explain it again. This means that their needs were not just hearing-related but also included concrete representation, repetition of explanations, and tangible assistance from the teacher. In mathematics learning, this is especially relevant, as mathematical concepts can be abstract and students may need to interpret relationships among numbers, symbols, and language. Thus, students' learning needs must be identified in terms of how they access mathematical meaning from objects, images, gestures, and simplified explanations.

The teacher's communication with parents also plays an important role in identifying students' mathematical learning needs. The classroom teacher explained that communication with parents was necessary to ensure that the way mathematics was taught at school could continue at home. This finding suggests that the identification of learning needs does not stop in the classroom, as deaf students may experience confusion when they receive different explanations or strategies across learning environments. Parental communication helps teachers understand students' learning habits outside school and supports consistency between school-based and home-based learning. This is in line with Gustafson et al. (2024), who argue that inclusive learning support requires collaboration among teachers, families, and other stakeholders to address students' needs more comprehensively.

The school's inclusive service system also strengthens the identification process. The inclusion coordinator explained that classroom teachers made modifications for students with special needs and that the school provided several service models, including full learning in the classroom, mentoring by shadow teachers or parents, and pull-out services in the resource room. This shows that identifying the mathematics learning needs of deaf students was not only the responsibility of the classroom teacher, but was also connected to institutional support. The presence of shadow teachers, parent involvement,

and resource room services enabled the school to respond more flexibly to students' needs. Thus, the identification of mathematics learning needs in this study can be understood as a collaborative and ongoing process involving the classroom teacher, deaf students, parents, and the school's inclusive service system.

The classroom teacher identified differences in students' abilities and communication needs; students confirmed the importance of concrete objects and repeated explanations; parents supported continuity of learning at home; and the school provided service modifications through inclusive programs. These findings show that effective identification of deaf students' mathematics learning needs requires more than teacher observation alone. It requires a responsive learning environment that recognizes individual differences, provides accessible communication, and fosters collaboration among all parties involved in students' learning.

**Classroom Teacher Strategies in Building Access to Mathematics Learning**

This study revealed that classroom teachers primarily provided access to mathematics learning by using visual, concrete, and repeated teaching methods for deaf students. Utilized pictures, concrete objects, demonstrations, lip movements, short phrases, and re-explanation to aid deaf students' understanding of mathematical concepts. The strategies suggest that equality of access to mathematics learning did not simply occur when deaf learners were placed in the same classroom as regular learners, but rather required that mathematical explanations be made more visible, concrete, and comprehensible. The students' responses further confirmed this, as they reported that mathematics was easier to understand when using objects and when the teacher re-explained the material.

The use of visual and concrete media became an important strategy because mathematics involves many abstract concepts that can be difficult for deaf students when presented solely through verbal explanations. In this study, pictures and concrete objects helped students connect numbers, symbols, and mathematical meanings with something they could see or touch. This means that visual and concrete media functioned not merely as supplementary teaching aids, but as primary access tools for deaf students. This finding is consistent with Pabis and Catalano (2023), who emphasize that deaf and hard-of-hearing students need explicit, contextualized support to understand mathematical vocabulary and concepts. Another part of the teacher's approach was to make classroom language more straightforward.

The teacher stated that when there were too many words on the chalkboard, the deaf students became confused, so she used shorter phrases and fewer words. This strategy is significant because access to mathematics for deaf students is not only about numbers but also about the language used to explain the relationships among them. Too much written or verbal explanation can pose further challenges for deaf students. Thus, in mathematics learning, short phrases and simple instructions helped minimize the linguistic obstacles the participants faced.

The other effective measure adopted was modifying communication between the teacher and the student during instruction. The teacher was facing the student, speaking a bit more slowly but still in a natural tone, turning down the background noise, and using some lip movements or gestures to support their speech. The gestures employed were not formal sign language, but were used as a form of communication support in the classroom. This finding indicates that the teacher's body position, speech clarity, facial visibility, and control of classroom noise were added to the strategy for making mathematics accessible. This is in line with Mealings et al. (2025), who explain that the learning of deaf or hard-of-hearing students is influenced by speaker visibility, speech clarity, and noise reduction in the learning environment.

The repeated explanation strategy also emerged as an important aspect in establishing access to learning mathematics. Students said that if they did not understand the lesson, they would ask the teacher, who would repeat the explanation. This indicates that repetition was not only a remedial activity but also a necessary one for deaf students to work with mathematical information more effectively. Repeated explanation in maths teaching helps pupils relearn symbols, words, and procedures that were not fully understood during the initial explanation. This finding supports Moustache and Makhoba (2024), who argue that students with hearing loss require responsive teaching strategies tailored to their communication and learning needs.

**Barriers and Supports in Building Access to Mathematics Learning**

The results of this research suggest that not only did hearing impairment pose difficulties for classroom teachers in providing access to deaf students' learning in mathematics, but other factors also contributed to this. The biggest problem was how to make mathematical language, symbols, explanations, and classroom interactions accessible to students who lack auditory access. Barriers to mathematics learning are pedagogical, linguistic, and communicative. Numbers and operations are not the only ways mathematics

is communicated; it's communicated through verbal instructions, relational terms, symbolic representations, and classroom practice. Thus, it is not enough to simply view a deaf student who has difficulties learning mathematics as having a personal limitation; it must also be viewed as a mismatch between how mathematical meaning is typically communicated to students and how it is communicated to a deaf student. This discovery adds further weight to the idea that the key to inclusive mathematics learning is for teachers to change access to meaning rather than to teach at a slower rate of speech.

One of the most significant barriers was limited instructional time. The classroom teacher had to divide her attention between two deaf students and other students with special needs in the same class. At the same time, the learning duration was limited and sometimes interrupted by other school routines. This condition made it difficult for the teacher to consistently provide slow, repeated, and individualized explanations. This finding implies that the effectiveness of inclusive learning is strongly influenced by classroom structure and teacher workload. Even when the teacher is sensitive to deaf students' needs, access to learning may remain constrained if the classroom context does not provide sufficient time and support. In this sense, inclusive education cannot rely only on teacher commitment; it also requires adequate classroom support, manageable student-teacher ratios, and flexible time allocation. This is in line with Moustache and Makhoba (2024), who emphasize that students with hearing loss need responsive support systems so that teachers can address individual learning needs more effectively.

The second barrier concerns the nature of mathematical language. The teacher identified abstract and relational terms such as before, after, more than, less than, and equal to as difficult for deaf students to understand. These terms are essential in mathematics because they help students interpret sequences, comparisons, quantities, and equivalences. However, for deaf students, such terms may be difficult because they are not always visible, concrete, or directly represented by objects. The difficulty became more evident in story problems and step-by-step instructions, where students were required to understand not only numbers but also the linguistic relationship between ideas. This finding suggests that deaf students' access to mathematics depends heavily on their access to mathematical language. Therefore, teachers need to teach mathematical vocabulary explicitly through concrete examples, pictures, gestures, simple sentences, and repeated comparison of meanings. This supports Pabis and Catalano (2023) and Santos and Cordes (2021), who highlight the importance of language access in the development of mathematical understanding among deaf and hard-of-hearing students.

The other obstacles were the limited availability of concrete learning media. The teacher explained that other class media were used, so the media were not always consistent. Thus, more concrete media were still needed. This is significant for the following reasons: the teacher's strategy was very concrete and visual, and the teacher's approach was heavily dependent on concrete, visual means. To overcome this limitation during classroom learning, the teacher used available classroom objects, pictures, gestures, and repeated verbal explanations as substitute media. The teacher also simplified mathematical tasks and adjusted explanations to students' visual and language needs so that abstract concepts could still be introduced even when specific concrete media were unavailable. This strategy shows that limited media were addressed through improvisation, visual support, and flexible instructional adaptation during the learning process.

## CONCLUSION

Teachers build access to mathematics learning for deaf students through three main processes: identifying individual learning needs, applying accessible teaching strategies, and managing barriers through collaborative support. First, the identification of mathematics learning needs was carried out through early approaches, observation of students' responses, recognition of differences between deaf students' abilities, and communication with parents. The classroom teacher found that the two deaf students had different levels of independence and communication needs, so they required different forms of assistance in mathematics learning. The students' responses also confirmed that concrete objects and repeated teacher explanations helped them understand mathematics more easily. Second, classroom teacher strategies in building access to mathematics learning were reflected in the use of pictures, concrete objects, visual language, short phrases, lip movement, gestures, and repeated explanation. These strategies helped make mathematical concepts more visible, concrete, and communicatively accessible for deaf students. The teacher not only delivers mathematics content, but also mediates mathematical meaning by adjusting the form of explanation to students' visual and language needs.

Third, the study found that both barriers and supports influenced access to mathematics learning. The main barriers included limited instructional time, the abstract and relational nature of mathematical language, difficulty in ensuring students' understanding, and limited availability of concrete learning media. However, these barriers were reduced through support from parents, peers, teacher assistance, speech therapy,

resource room services, and school-level inclusive programs. The inclusion coordinator explained that the school provided several service models, including full learning with the classroom teacher, mentoring by shadow teachers or parents, and pull-out services in the resource room.

The focus of this study is the empirical description of how access to mathematics learning for deaf students is developed in an inclusive elementary classroom. The findings suggest that there is more to inclusive mathematics learning than simply integrating deaf learners into regular classrooms; it is about redesigning communication, media, language, learning support, and collaboration. Teachers will have to continuously identify individual needs during practice, employ visual and concrete strategies, demystify mathematics, and collaborate with parents and school support services. The results suggest that educational institutions must improve service systems for deaf students by providing more concrete support for mathematics media, providing assistance, and including deaf students in the mathematics learning process.

There are multiple limitations in this study. First, the findings are limited to one inclusive elementary school and one classroom teacher, two deaf students, and one inclusion coordinator. Second, the data were collected at a single school; thus, the results cannot be generalized to other schools. Second, the study was based on interview data and therefore did not directly assess students' mathematics achievement or observe classroom practices for an extended time. Third, the study was limited to classroom teachers' role in establishing access to math learning, and the roles of parents, shadow teachers, and peers were only mentioned in supporting roles. Future research should include additional schools and further integration to explore the roles of parents, peers, and shadow teachers in supporting deaf students' access to mathematics learning.

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