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# Training Need Assessment for Teachers Teaching Mathematics to Children with Hearing Impairment

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## Abstract

Mathematics teaching for children with hearing impairment is unique challenges that require specialized teaching strategies. The aim of this study is to assess the needs of the professional development of teachers who instructed mathematics to students with hearing disabilities. A quantitative and descriptive research design was used using a sample of 335 teachers selected through simple random sampling. The data was collected through a separately developed questionnaire focusing on teachers' expertise in specialized teaching strategies, using technology and knowledge with sign language and visual aids. The findings emphasize that while teachers express confidence in teaching mathematics, there are significant gaps in their training, especially in sign language, visual aids, digital instruments and inclusive teaching strategies. The study also reveals demographic differences in the perceived need for professional development, while teachers in rural areas and those who have more experience in reporting higher training needs.

Research underlines the importance of adapted and ongoing professional development programs that will equip teachers with skills necessary for effective teaching mathematics for hearing students.

***Keywords:*** *Training, Assessment, Teachers, Mathematics, Hearing Impairment*

## Introduction

Mathematics teaching for children with hearing impairment is a unique set of challenges that require specialized teaching strategies. Traditional methods of teaching mathematics are strongly relying on auditory explanations, which can be difficult to effectively understand for students with hearing impairment (Santos & Cordes, 2022). Teachers must integrate alternative teaching methodologies, including sign language, visual aids and interactive technologies to increase mathematical understanding (Fadare et al., 2024). Despite the growing recognition of these strategies, research suggests that many educators lack the necessary training for their effective implementation (Markaki et al., 2021). This gap emphasizes the need for a systematic assessment of training needs (TNA) to identify the requirements for the professional development of teachers working with hearing disabilities. By performing a complex TNA, teachers can undergo targeted training, which equip them with skills necessary to provide inclusive and effective teaching of mathematics.

The importance of specialized training of teachers in mathematics for students with hearing disabilities was widely recognized in academic literature. Studies suggest that many teachers do not have adequate sign language knowledge, which limits their ability to communicate complex mathematical concepts (Cilibero, 2024). In addition, traditional teaching approaches often cannot include visual learning techniques that are essential for students with hearing impairment (Langdon et al., 2023). Research Navarrete et al. (2023) emphasizes that the use of graphic organizers, manipulatives and digital simulations significantly improves mathematical understanding among students affected by hearing. In addition, it has been shown that the integration of assistance technologies such as interactive whiteboards and subtitles increases the results of the involvement of students and learning (Nelson et al., 2022). However, teachers can try to use these tools without appropriate training. The solution of these gaps requires professional development programs that focus on the equipment of educators with skills to implement various teaching strategies adapted to the needs of students with hearing disabilities.

The reason for this study is rooted in urgent need to assess and solve the requirements of professional training of teachers who instruct mathematics to students with hearing impairment. Research shows that inclusive educational policy itself is insufficient if teachers are not sufficiently trained to perform specialized teaching strategies (Westwood, 2020). Due to the cognitive and linguistic differences of students with hearing disabilities, teachers must accept adaptive teaching methodologies, including differentiated teaching and powerful evaluation to support effective

learning (Film, 2024). In addition, Ariza and Hernández Hernández (2025) emphasizes that teachers who undergo training in technological integration report a higher level of trust and improve students' performance. The findings of this study will contribute to the development of targeted professional development programs dealing with specific challenges faced by teachers in teaching mathematics to hearing students. The aim of this research is to identify key areas for improvement through structured TNA to increase the effectiveness of mathematics teaching and to support fair opportunities for learning for students with hearing disabilities. The prime objectives of this research is to assess the professional development needs of teachers for effectively teaching mathematics to children with hearing impairments.

**Literature Review**

Mathematics teaching for children with hearing impairment requires specialized pedagogical approaches that meet their unique educational needs. Research shows that traditional mathematics teaching often relies strongly on verbal explanations that can be demanding for students with hearing impairment (Santos & Cordes, 2022). To bridge this gap, teachers must use alternative instructional strategies such as visual aids, sign language and interactive technologies to increase mathematical understanding (Fadare et al., 2024). However, the effectiveness of these methods largely depends on the readiness and professional training of teachers, which emphasizes the need for a comprehensive assessment of training needs (TNA) to identify gaps and improve teaching procedures (Markaki et al., 2021).

Well structured TNA is essential for understanding competencies that teachers have to develop to teach mathematics for students with hearing impairments effectively. Studies suggest that many teachers lack specialized training in inclusive education, especially in mathematical teaching adapted to students with hearing disabilities (Gargululo & Metcalf, 2010). Research Clark et al. (2025) emphasizes that teachers often fight the adaptation of the instructional content due to limited exposure to mathematical sign language terminologies and insufficient opportunities for professional development. These challenges emphasize the need for targeted educational programs designed to equip teachers with skills and strategies needed for effective teaching.

One of the key areas where teachers require training is the use of sign language for teaching mathematics. According to Cilibero (2024), many teachers do not have enough sign language knowledge to effectively communicate abstract mathematical concepts. This restriction prevents students from understanding complex ideas and can lead to significant gaps in learning. The McPherson study (2024) suggests that educational programs involving sign language mathematics can increase the confidence of teachers and understanding students. This emphasizes the importance of integrating knowledge as an essential part of teachers' training programs.

Visual learning strategy plays a key role in teaching mathematics for students with hearing impairment. Research shows that the use of manipulatives, diagrams and multimedia sources

significantly improves mathematical understanding (Langdon et al., 2023). Study Navarrete et al. (2023) found that students with hearing impairments were better in mathematics when teachers used visual instructional aids such as graphic organizers and digital simulations. Training programs should therefore focus on strengthening the ability of teachers to integrate the strategy of visual teaching to improve learning results.

Another critical aspect of teachers training is the integration of technology into mathematics teaching. Digital tools such as interactive whiteboards, educational applications and subtitles have been shown to make better engagement and understanding among hearing students (Nelson et al., 2022). The study of Ariza and Hernández Hernández (2025) revealed that teachers who had completed the training of technology into their lessons reported higher confidence in mathematics teaching and observed improved students' performance. This suggests that professional development programs should prefer technological integration to increase teaching efficiency.

Differentiated teaching is also necessary to deal with various educational needs of students with hearing impairment. Westwood research (2020) emphasizes that the approach of universal everything is ineffective for teaching mathematics for students with hearing disabilities. Instead, teachers should be trained to adjust teaching strategies based on individual needs, learning styles and abilities. The Film (2024) study has shown that teachers who used differentiated teaching strategies have experienced greater involvement of students and higher academic achievements. This finding strengthens the need for educational programs that emphasize adaptive teaching methods.

The role of evaluation in mathematical teaching for students with hearing impairment cannot be overlooked. Traditional methods of evaluation may not accurately measure the mathematical skills of these students due to communication barriers (Newman & Chadwick, 2022). Alternative evaluation techniques, such as performance -based tasks, visual evaluation and interactive problems to solve problems, have been designed as more effective methods (Bowen & Probst, 2023). Teachers need professional training to effectively implement these techniques and ensure that they can accurately assess the progress of students and adjust teaching accordingly.

Co -educational approaches also contribute to the success of mathematical education for students with hearing impairments. Research from Farlow (2024) found that the activities of the group for peer-asisted learning and cooperative groups increase mathematical understanding and engagement of students. However, teachers often lack the necessary training to facilitate cooperation in classes with students with hearing disabilities (Fadare et al., 2024). Professional development programs should therefore include training on the structuring of cooperation activities that are inclusive and accessible.

Cultural and linguistic considerations are essential in designing educational programs for teachers working with students with hearing disabilities. According to Martínez-Lávarez (2025), students of hearing disabilities can come from a diverse language environment, including those who use sign language as their first language and others to read lips or written text. Teachers must be trained to recognize and adapt these linguistic differences to ensure effective teaching of mathematics (Fadare et al., 2024).

## Research Methodology

### Research design:

This study uses a quantitative and descriptive research proposal to systematically assess the needs of training teachers who instruct mathematics for children with hearing impairment. The descriptive approach allows in -depth examination of current knowledge, skills and professional development of teachers, while quantitative approach ensures objective measurements and statistical data analysis.

### Research population:

The population of this study includes teachers dealing with students with hearing impairments in various educational institutions. These teachers include special education teachers who provide mathematical teaching to students with hearing disabilities.

### Sample and sampling technique:

A total of 335 teachers were selected as a simple random sample method as a research sample. This technique ensures that every teacher in the target population has the same chance to be included in the study, increasing the representativeness and generalization of findings.

### Research tool:

A separate questionnaire was designed for data collection, developed with existing literature. The questionnaire includes sections that evaluate teachers' knowledge in specialized teaching strategies, their use of technology in mathematical teaching and their knowledge of sign language and visual learning. The tool was structured to capture both demographic information and reactions related to training needs.

### Validity and reliability:

In order to ensure the validity of the research tool, the questionnaire was reviewed by experts in the field of teaching special education and mathematics. Pilot testing was carried out with a small group of teachers to improve the questionnaire items. The tool reliability was tested using Cronbach's alpha, which ensured internal consistency and reliability in measuring the needs of training.

### Data collection:

The data was collected using physical distribution and online survey using the Google Forms link. This dual approach facilitated wider participation and ensured teachers' answers in various geographical locations and institutional environments.

### Data analysis:

The collected data was analyzed using SPSS (statistical package for social sciences). Both descriptive and inference statistical methods were used. Descriptive analysis included frequency distribution, percentages and average scores to summarize the answers, while the inference analysis included statistical tests such as T-tests and Anova to identify significant differences based on demographic factors and pedagogical experiences.

**Table 1**

*Frequency Distribution at the Basis of Demographics*

| Title | Description | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Male | 118 | 35.2% |
| | Female | 217 | 64.8% |
| | | 335 | 100% |
| Age of Respondents | 21-30 Y | 4 | 1.2% |
| | 31-40 Y | 98 | 29.3% |
| | 41-50 Y | 190 | 56.7% |
| | 51-60 Y | 43 | 12.8% |
| | | 335 | 100% |
| Designation | SSET | 185 | 55.2% |
| | JSET | 150 | 44.8% |
| | | 335 | 100% |
| Qualification | Master | 227 | 67.8% |
| | M.Phil. | 100 | 29.9% |
| | PHD | 8 | 2.4% |
| | | 335 | 100% |
| Place of Posting | School | 161 | 48.1% |
| | Center | 174 | 51.9% |
| | | 335 | 100% |
| Area of Posting | Rural | 53 | 15.8% |
| | Urban | 282 | 84.2% |
| | | 335 | 100% |
| Experience | 1-5 Y | 64 | 19.1% |
| | 6-10 Y | 165 | 49.3% |
| | 11-15 Y | 93 | 27.8% |
| | >15 Y | 13 | 3.9% |
| | | 335 | 100% |

The frequency distribution table shows the demographics of the respondents, with the majority being female (64.8%), aged 41-50 years (56.7%), holding a Master's degree (67.8%), working as SSET (55.2%), posted at centers (51.9%), located in urban areas (84.2%), and having 6-10 years of experience (49.3%).

**Table 2**

*Frequency Distribution at the Basis of Question Asked*

| Sr. | Statements of Questions | SA | A | UD | DA | SDA | M | SD |
|---|---|---|---|---|---|---|---|---|
| 1 | I feel confident in my ability to teach mathematics to children with hearing impairments. | 187<br>56% | 127<br>38% | 17<br>5% | 4<br>1% | 0<br>0% | 4.48 | 0.65 |
| 2 | I require additional training to effectively use sign language for mathematics instruction. | 166<br>50% | 155<br>46% | 14<br>4% | 0<br>0% | 0<br>0% | 4.45 | 0.58 |
| 3 | Visual teaching aids improve my ability to teach mathematics to students with hearing impairments. | 136<br>41% | 184<br>55% | 11<br>3% | 0<br>0% | 4<br>1% | 4.34 | 0.66 |
| 4 | I need professional development in using digital tools and assistive technologies for mathematics instruction. | 150<br>45% | 154<br>46% | 9<br>3% | 17<br>5% | 5<br>1% | 4.27 | 0.86 |
| 5 | I have received sufficient training on inclusive teaching strategies for hearing-impaired students. | 100<br>30% | 172<br>51% | 43<br>13% | 20<br>6% | 0<br>0% | 4.05 | 0.82 |
| 6 | I require more specialized training to adapt mathematical concepts for hearing-impaired learners. | 116<br>35% | 147<br>44% | 52<br>16% | 20<br>6% | 0<br>0% | 4.07 | 0.86 |
| 7 | Professional workshops and training programs enhance my skills in teaching mathematics to students with hearing impairments. | 118<br>35% | 165<br>49% | 42<br>13% | 5<br>1% | 5<br>1% | 4.15 | 0.81 |
| 8 | I struggle with assessing the mathematical understanding of students with hearing impairments. | 123<br>37% | 178<br>53% | 26<br>8% | 3<br>1% | 5<br>1% | 4.23 | 0.75 |
| 9 | I need training on developing and implementing differentiated instructional strategies for mathematics. | 103<br>31% | 182<br>54% | 35<br>10% | 0<br>0% | 15<br>4% | 4.07 | 0.90 |
| 10 | Collaborating with special education experts improves my ability to teach mathematics to students with hearing impairments. | 135<br>40% | 146<br>44% | 25<br>7% | 19<br>6% | 10<br>3% | 4.13 | 0.98 |
| 11 | My institution provides adequate support for professional development in inclusive mathematics instruction. | 126<br>38% | 156<br>47% | 40<br>12% | 5<br>1% | 8<br>2% | 4.16 | 0.87 |
| 12 | | 107 | 150 | 53 | 20 | 5 | 4.00 | 0.92 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | I require training to design accessible and engaging mathematics lesson plans for hearing-impaired students. | 32% | 45% | 16% | 6% | 1% | | |
| 13 | I need guidance on incorporating real-life applications into mathematics lessons for students with hearing impairments. | 101<br>30% | 178<br>53% | 39<br>12% | 14<br>4% | 3<br>1% | 4.07 | 0.81 |
| 14 | Parental involvement significantly enhances the effectiveness of mathematics instruction for hearing-impaired students. | 125<br>37% | 168<br>50% | 27<br>8% | 15<br>4% | 0<br>0% | 4.20 | 0.77 |
| 15 | I need more opportunities for hands-on practice and mentorship in teaching mathematics to children with hearing impairments. | 139<br>41% | 156<br>47% | 31<br>9% | 9<br>3% | 0<br>0% | 4.27 | 0.74 |
| 16 | Ongoing professional development is essential for improving my instructional effectiveness in mathematics for students with hearing impairments. | 107<br>32% | 194<br>58% | 23<br>7% | 11<br>3% | 0<br>0% | 4.19 | 0.70 |

The frequency distribution for the responses to the questions highlights the professional development needs of teachers in teaching mathematics to children with hearing impairments. A majority of respondents expressed confidence in their ability to teach mathematics (M = 4.48, SD = 0.65), but there is a clear need for further training in areas such as sign language (M = 4.45, SD = 0.58), visual aids (M = 4.34, SD = 0.66), and the use of digital tools (M = 4.27, SD = 0.86). Teachers also expressed a demand for professional development in inclusive teaching strategies (M = 4.05, SD = 0.82) and specialized training for adapting math concepts for hearing-impaired students (M = 4.07, SD = 0.86). There was strong agreement that workshops and collaborations with experts enhance teaching skills (M = 4.15, SD = 0.81), while the need for mentorship and hands-on practice (M = 4.27, SD = 0.74) and ongoing professional development (M = 4.19, SD = 0.70) was also emphasized. Overall, the teachers identified several areas for improvement to enhance their instructional effectiveness.

**Table 3**

*Independent Sample t-test at the Basis of Gender of Respondents*

| Gender | N | Mean | Std. Deviation | df | t | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| Male | 118 | 67.03 | 6.44 | 333 | -0.22 | 0.83 |
| Female | 217 | 67.18 | 6.49 | | | |

The independent sample t-test shows no significant difference in the means of male and female respondents' scores (t = -0.22, p = 0.83), indicating that gender does not affect the variable being measured.

**Table 4**

*Independent Sample t-test at the Basis of Designation of Respondents*

| Designation | N | Mean | Std. Deviation | df | t | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| SSET | 185 | 68.07 | 5.73 | 333 | 3.00 | 0.003 |
| JSET | 150 | 65.97 | 7.11 | | | |

The independent sample t-test reveals a significant difference between SSET and JSET respondents' scores (t = 3.00, p = 0.003), with SSET respondents having higher mean scores.

**Table 5**

*Independent Sample t-test at the Basis of Place of Posting of Respondents*

| Place of Posting | N | Mean | Std. Deviation | df | t | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| School | 161 | 68.40 | 6.76 | 333 | 3.53 | 0 |
| Centre | 174 | 65.95 | 5.95 | | | |

The independent sample t-test indicates a significant difference in the scores between respondents posted at schools and those posted at centers (t = 3.53, p = 0), with school respondents having higher mean scores.

**Table 6**

*Independent Sample t-test at the Basis of Area of Posting of Respondents*

| Area of Posting | N | Mean | Std. Deviation | df | t | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| Rural | 53 | 70.28 | 6.66 | 333 | 3.96 | 0 |
| Urban | 282 | 66.54 | 6.26 | | | |

The independent sample t-test shows a significant difference in the scores between respondents posted in rural and urban areas (t = 3.96, p = 0), with rural respondents having higher mean scores.

**Table 7**

*One-way ANOVA test at the Basis of Age of Respondents*

| Age | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 1023.05 | 3 | 341.02 | 8.73 | 0.00 |
| Within Groups | 12926.43 | 331 | 39.05 | | |
| Total | 13949.48 | 334 | | | |

The one-way ANOVA test indicates a significant difference in the scores across different age groups (F = 8.73, p = 0.00), suggesting that age has an impact on the variable being measured.

**Table 8**

*One-way ANOVA test at the Basis of Qualification of Respondents*

| Qualification | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 522.19 | 2 | 261.10 | 6.46 | 0.00 |
| Within Groups | 13427.29 | 332 | 40.44 | | |
| Total | 13949.48 | 334 | | | |

The one-way ANOVA test shows a significant difference in the scores based on respondents' qualifications ($F = 6.46$, $p = 0.00$), indicating that qualification affects the variable being measured.

**Table 9**

*One-way ANOVA test at the Basis of Experience of Respondents*

| Experience | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 1050.62 | 3 | 350.21 | 8.99 | 0.00 |
| Within Groups | 12898.86 | 331 | 38.97 | | |
| Total | 13949.48 | 334 | | | |

The one-way ANOVA test reveals a significant difference in the scores based on respondents' years of experience ($F = 8.99$, $p = 0.00$), indicating that experience influences the variable being measured.

**Findings**

The study, based on demographic and questionnaire data, provides insight into various aspects of professional development for teachers working with hearing disabilities in mathematics. Demographic analysis of respondents shows a clear majority of female teachers (64.8%), while the highest age group is 41–50 years (56.7%). Most respondents held a master's degree (67.8%) and worked as head teachers (SSET) (55.2%). Respondents were evenly divided between publication at schools (48.1%) and centers (51.9%). Most respondents came from urban areas (84.2%) and most of them had 6-10 years of pedagogical experience (49.3%).

The questionnaire responses emphasize several areas where teachers feel the need for professional development. Teachers expressed strong confidence in their ability to teach mathematics to students with hearing disabilities ($M = 4.48$, $SD = 0.65$), but recognized the need for further training in areas such as sign language ($M = 4.45$, $SD = 0.58$) and AIDS visual teaching ($M = 4.34$, $SD = 0.66$). In addition, a significant number of teachers identified the need for professional development in digital instruments ($M = 4.27$, $SD = 0.86$) and inclusive teaching strategies ($M = 4.05$, $SD = 0.82$). The demand for specialized training has adapted mathematical concepts for students with hearing disabilities ($M = 4.07$, $SD = 0.86$).

Teachers said that professional workshops and cooperation with experts increased their teaching skills ($M = 4.15$, $SD = 0.81$). In addition, there was a strong desire for more practical

practice and mentoring (M = 4.27, SD = 0.74) and continuing professional development (M = 4.19, SD = 0.70) to improve the effectiveness of teaching in mathematics for students with hearing disabilities. The independent results of the T -Test sample did not reveal any significant gender difference in the responses (T = -0.22, p = 0.83), suggesting that gender does not affect the needs of professional development or the effectiveness of respondents teaching. However, a significant difference was observed on the basis of respondents' designation. SSET teachers reported a higher average score (M = 68.07) compared to junior special education teachers (JSET) (M = 65.97), with a value of T 3.00 and p-value 0.003, indicating that SSET teachers perceived a higher need for professional development.

In addition, a significant difference in responses was found on the basis of the broadcast. Teachers sent in schools (M = 68,40) showed a higher average score compared to teachers published in centers (M = 65,95), with a value of T 3.53 and value P 0, suggesting that school teachers have a higher perceived need for professional development. The broadcast area also significantly influenced the answers, and teachers published in rural areas (M = 70,28), which showed a higher need for professional development compared to those published in urban areas (M = 66,54). The result of the T-test (t = 3.96, p = 0) suggests that teachers in rural areas feel the more urgent need for training to increase their effectiveness of the instructions.

The one -way Anova test revealed significant differences based on age, qualifications and years of experience. Teachers of different age groups showed different professional development needs, while younger teachers (at the age of 21-40) showed a lower average score, while older teachers (aged 41-60) had a higher score (F = 8.73, p = 0.00). Similarly, respondents with a master's degree showed a higher average score (M = 67.88) than those with M.PHil. (M = 65,81) or PhD (M = 61,25), S F = 6,46 and P = 0.00 indicating that the qualification plays a role in the perception of training needs. Also, respondents' experience has also influenced their reactions, while teachers have 6-10 years of experience (M = 68.54), suggesting higher professional development needs compared to those with less experience (F = 8,99, p = 0.00).

The study finds out that while teachers feel confident in teaching mathematics for students with hearing disabilities, there is a considerable need for continuing professional development in areas such as sign language, visual aids, digital instruments and inclusive teaching strategies. In addition, the results suggest that SSET teachers, teachers published in schools, rural teachers and those who have more experience, tend to perceive a higher need for professional development. This knowledge emphasizes the importance of tailor -made programs tailored to improve teachers' ability to effectively teach mathematics to students with hearing disabilities.

**Discussion**

The outcome of this research suggests that although teachers generally have confidence in mathematics teaching for students with hearing disabilities, in some areas it is clear that they

require further professional development. In particular, teachers emphasized the need for training on sign languages, visual teaching and digital resources that are necessary for the provision of available and effective teaching for hearing students. This suggests that while teachers can offer mathematics teaching, special skills and knowledge are needed to ensure that their teaching methods are suitably adapted to the requirements of these students.

Research also focuses on inclusive teaching strategies. Teachers have accepted that adaptation of mathematical concepts for students with hearing disabilities includes special techniques and tools that may not be reasonably trained. This agrees with literature, which means that effective integration into learning requires continuing professional development, especially in specific strategies to satisfy various educational needs (Holmqvist & Lelinge, 2021). Obviously, there is a specialized training needed to allow teachers to develop an inclusive teaching environment that supports the full educational potential of students with hearing disabilities.

The activity of professional development and cooperation workshops was also emphasized as an important part for strengthening teaching (Bergmark, 2023). Teachers said that their teaching processes were strengthened by revealing new approaches and methods, especially if they were given a chance to cooperate with experts and colleagues. This is in line with the opinion that cooperation between teachers and the exposure of professional networks is the basic factors of good professional development because they allow sharing ideas and innovative solutions to the problems that relate to them in the classroom (Fairman et al., 2022).

In addition, there was an enthusiastic demand for practical practice and mentoring and permanent professional development. This suggests that teachers learn from the practical use of theoretical knowledge in the real world, as well as from continuous support and management in their professional development. Obviously, teachers are aware of the need for permanent learning and acquiring skills to maintain a step with developing pedagogical instruments and methods, especially when education of students with special needs.

Research also found certain demographic differences in the need for professional development. Those who have more years of experience and those who teach in rural schools or in a specialized environment have given a higher need for further training. This finding emphasizes the various challenges that teachers encounter on the basis of their location, level of experience and the nature of the educational environment in which they practice. This would mean that professional development programs should be redesigned to deal with these specific needs and offer focused assistance if it is most necessary.

Although the teachers showed confidence in teaching mathematics to children with hearing impairment, the results emphasize the need for continuing targeted professional development. The training should focus on the equipment of teachers needed in such areas as sign language, visual aids, digital tools and inclusive teaching strategies. To improve the effectiveness of teaching and

supporting teachers in satisfying students' needs with hearing disabilities dealing with specific challenges that teachers face teachers in different contexts.

## Conclusion

The results of this research emphasize the importance of professional development activities for teachers who teach students to listen to mathematics. Although teachers generally report confidence in their ability to teach mathematics, they recognize remarkable gaps in training, especially in sign language, visual teaching, digital instruments and inclusive teaching methodologies. These regions are decisive for providing efficient and available teaching to students with hearing disabilities. Research emphasizes that knowledge specific to the subjects and continuous training is necessary for instructors to modify their practice for different needs of students and facilitate the inclusive educational environment that increases education results.

The study also reveals demographic differences in the perceived need for professional development, with teachers in rural areas, those who have more experience and those published in schools, expressing a stronger need for further training. This emphasizes the various challenges that teachers face their location, experience and context. To solve these needs, professional development programs must be proposed with flexibility, which ensures that they are relevant to specific challenges that teachers encounter in different environments. In the end, the study requires a continuous and targeted approach to professional development and ensures that teachers are equipped with skills and resources necessary for effective teaching mathematics for hearing students.

## Recommendations

- Consider specialized workshops of professional development on language languages, visual aids, digital technologies and inclusive teaching for students with hearing disabilities.
- Adapt the initiative in the field of professional development to solve specific needs of the teacher according to the experience, location and educational environment.
- Support practical practice, mentoring and continuous professional development to increase the efficiency of teaching for instructors with hearing impairment.

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