

Innovative Strategies of Sign Language Interpretation Services to Optimize Learning for Deaf Students in Inclusive Classrooms: An In-Depth Study in Inclusive Schools

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Abstract : *This study focuses on exploring the effectiveness of sign language interpretation services in supporting the learning involvement of deaf students in inclusive classrooms. In the context of the limited number of professionals who are proficient in sign language, this study examines the role of peers, the use of local signs, and guest speakers as alternative interpretations applied in inclusive schools. This research uses a qualitative method with a phenomenological approach, which allows for deepening the experiences and perceptions of various related parties, including deaf students, teachers, and school principals. Data were collected through in-depth interviews and direct observation in two inclusive schools in a specific region, involving 32 participants consisting of principals, sign language teachers, non-professional teachers, and deaf students. The data analysis technique used is the thematic analysis of Miles and Huberman, which includes the stages of data reduction, data presentation, and conclusion drawing and verification. The results showed that although peers and local signs helped with minimal involvement of deaf students, the presence of professional sign language teachers was more effective in ensuring a deep understanding of the subject matter. In addition, guest speakers from local education offices contribute positively to learning, despite limited availability and lack of sustainability. These findings underscore the importance of developing comprehensive and professional interpretation services in creating an inclusive educational environment. The implications of this study are the need for long-term strategies involving peer training and recruitment of professional sign language teachers to support the learning engagement of deaf students, as well as the provision of policies that are responsive to the communication needs of students with special needs in inclusive schools.*

INTRODUCTION

In the era of globalization and technological advancement, attention to inclusivity in education is the main focus, especially in the context of fulfilling the rights of students with special needs such as deaf students (de Prado, 2021; Zaini, 2023; Shaw, 2024). According to UNESCO data (2021) in Salmi & D'Addio, (2021), about 34 million children worldwide have hearing loss, and this figure shows the importance of fair and equal access to education for them. This reality demands the presence of an education system that is able to accommodate their unique needs in an inclusive classroom (Zabeli et al., 2021; Jdaitawi & Kan'an, 2022; Chuanchen, 2023), an educational approach that facilitates students with a variety of special needs to learn together with friends without disabilities (Paulsrud & Nilholm, 2023; Iacono et al., 2023; Hasanah & Hefniy, 2023). Inclusive education itself is based on the principle that every child has the right to education in a friendly, accessible, and supportive environment (Tryfon et al., 2021; Jansson et al., 2022; Norman & Paramansyah, 2024). Therefore, developing strategies and services that support the learning involvement of deaf students in inclusive classrooms is an important academic issue (Zaki & Ismail, 2021; Susilawati & Astuti, 2022; Partington et al., 2024), both from a social and pedagogical perspective, to achieve comprehensive educational inclusion (Namanyane & Shaoan, 2021; Maulidah et al., 2023; Domingo-Martos et al., 2024).

The phenomenon found in the field shows the limited human resources who are proficient in sign language in many inclusive schools, which ultimately makes teachers and deaf students have to rely on sign language interpretation from peers or simple local signs. This poses a problem because the quality of interpretation provided by peers or local signs is often inadequate in helping deaf students understand the material thoroughly (Wijaya & Khoir, 2022; Aljedaani et al., 2023; Rahajeng et al., 2024), especially in lessons that require complex explanations. For example, observations show that deaf students often have difficulty following lessons in science or math classes that contain a lot of technical terms. The lack of competent professionals in sign language not only reduces the quality of learning but also threatens the right of deaf students to an equal education. This issue illustrates the urgency to explore and develop a more effective sign language interpretation service system in an inclusive educational environment.

Previous studies have revealed various approaches to support the learning involvement of deaf students in inclusive classrooms, but there are still aspects that have not been explored in depth. Freitas et al. (2022) in their research showed that the existence of sign language professionals increases the active participation of deaf students and improves their understanding in the classroom. Dalgaard et al. (2022) also mentioned that inconsistencies in the availability of interpretation personnel resulted in a decrease in learning engagement and understanding of deaf students, demonstrating the importance of the continuous presence of professional interpreters in every class session. In addition, Kokorelias et al. (2024) highlight the role of external collaborations such as guest speakers in supporting inclusive education, although these interventions face challenges in terms of sustainability and frequency of attendance.

These findings provide a strong basis for this study, but no research has specifically explored the effectiveness of a combination of peers, local signs, and professionals in supporting the overall learning engagement of deaf students in an inclusive classroom setting. This gap provides room for further research in understanding how the role of this combination of interpretation strategies can be optimized in inclusive classrooms.

Although previous research has discussed various approaches in supporting the learning engagement of deaf students, there are still relevant gaps to fill, especially related to the integration and effectiveness of the use of peers, local signs, and guest speakers in sign language interpretation services in inclusive classrooms. Most previous studies have focused on a single method of interpretation, so there has been no comprehensive study that explores the combination of several methods to support the learning of deaf students. This study aims to fill this gap by examining how these various approaches interact and can be optimized in an inclusive classroom. Filling this gap is expected not only to make a significant contribution to inclusive education literature but also to provide practical insights for policymakers and educators in providing more holistic services for deaf students.

The novelty of this study lies in its interdisciplinary and comprehensive approach in integrating sign language interpretation methods through peers, local signs, and guest speakers simultaneously to support the involvement of deaf students in inclusive classrooms. This study offers a new perspective in the field of inclusive education studies by exploring the efficiency and limitations of each method when combined, which has not been widely reviewed in the previous literature. Through in-depth empirical analysis, this research is expected to provide innovative methods in optimizing the involvement of deaf students, thereby creating a more effective and sustainable interpretation system in inclusive schools. This novelty provides an important added value in inclusive educational literature and offers an applicable solution for educational institutions in implementing sign language interpretation strategies.

This study aims to identify and analyze the effectiveness of various methods of sign language interpretation, including the role of peers, the use of local signs, and the support of guest speakers in improving the learning engagement of deaf students in inclusive classrooms. This research is important to achieve a better understanding of how these different methods can complement and optimize in the context of inclusive classrooms. By examining the effectiveness of this combination of interpretation methods, this study is expected to make a significant contribution to the development of inclusive education policies that are more adaptive and responsive to the needs of deaf students.

RESEARCH METHOD

The research method used in this study is qualitative research with a phenomenological approach (Renjith et al., 2021; Alhazmi & Kaufmann, 2022; Papatsimouli et al., 2023). The selection of this type of research is based on the main goal of the research, which is to deeply explore the experiences, perspectives.

Understanding of individuals regarding the role of sign language interpretation services in supporting the learning involvement of deaf students in inclusive classrooms. The phenomenological approach was chosen because it corresponds to the need to understand the phenomenon from the participant's point of view and capture the meaning they perceive subjectively.

The data collection techniques used in this study include in-depth interviews and direct observation. The study was conducted in two inclusive schools in specific regions, where the schools provided specialized services for deaf students. The selection of this location is based on the existence of an inclusive program that has been running and involves deaf students in teaching and learning activities in the classroom with other students, so that it becomes an ideal environment to explore the use of sign language interpretation. The number of respondents taken consisted of 32 participants, including two school principals, six sign language teachers, six non-professional teachers who assisted with interpretation services, and eighteen deaf students. This number is considered sufficient to provide a comprehensive perspective on the dynamics of interpretation services in inclusive classrooms. In-depth interviews were conducted individually with each participant to capture the details of their experiences and perceptions, while observations were conducted during teaching and learning activities to see direct interactions between teachers, interpreters, and deaf students.

The data analysis technique used in this study is the thematic analysis technique from Miles and Huberman (Mezmir, 2020; Jayachandran et al., 2021; Riazi et al., 2023), which consists of several main stages: data reduction, data presentation, and conclusion drawn. First, at the data reduction stage, the data collected through interviews and observations is reduced by selecting and sorting information relevant to the focus of the research. This is done to filter essential information from the very rich raw data. Then, the data that has been reduced is presented in the form of tables, narratives, or diagrams to make it easier to understand and identify emerging patterns or themes. The presentation of this data allows researchers to explore the relationship between existing themes. The final stage is conclusion drawing and verification, where the researcher searches for the deep meaning of the data presented, interprets the results based on relevant theories, and verifies through data triangulation to ensure the validity and validity of the findings. This approach provides a systematic structure and allows researchers to devise a rich and in-depth interpretation of the phenomenon of sign language interpretation services in the context of inclusive education.

FINDINGS AND DISCUSSION

The findings of this study explain various aspects regarding the application of sign language interpretation services in supporting the learning involvement of deaf students in inclusive classrooms. Each finding reveals the experiences and perspectives of the various parties involved, including teachers, deaf students, and other educators.

Through interviews and observations, this study explores the role played by peers, professional sign language teachers, as well as alternative interpretations using local signs and the presence of guest speakers. These findings are expected to provide a deeper understanding of how each approach affects the effectiveness of learning in inclusive classrooms and reflect the school's efforts in creating an inclusive environment for deaf students. The following are the main findings obtained from this study in sub-sub-sections that describe each approach in sign language interpretation services.

The Role of Peers in Sign Language Interpretation Services to Support Learning Engagement

The first findings of this study show that peers play a significant role in providing interpretation services for deaf students in inclusive classrooms. This role arises due to the lack of availability of teaching staff who are proficient in sign language, so teachers rely on the help of other students who have basic skills in sign language to help communication for deaf students. Several sources confirmed this. A teacher at school A stated: "We often rely on sign-language peers to help with classroom communication. Even though they are not professional translators, it helps deaf students understand the lessons." (Teacher-7, October 2022).

These interviews show a great reliance on non-professional students to fill interpretive roles that actually require special skills. A principal at school B added, "With a minimal number of sign language teachers, we had no choice but to ask other students to help. However, there are concerns about whether the information conveyed is really well understood by deaf students." (Principal-2, October 2022). This statement indicates that while peer support is helpful, there are doubts regarding its effectiveness in conveying accurate information. A deaf student at school A also affirms: "I often feel helped, but not all of my friends can convey the lesson clearly. Sometimes there are parts that I don't understand." (Deaf Student-4, October 2022).

Classroom observations reveal that peer support is often spontaneous, without formal structure or training, which sometimes makes the translated message or knowledge not entirely accurate. Deaf students show limited understanding in some sessions, especially when the peer on duty does not fully understand sign language.

The role of peers in providing interpretation services in inclusive classrooms can provide benefits for deaf students to engage in learning, but it also contains challenges related to the accuracy and quality of the information conveyed. Vygotsky's theory of social interaction (Rahajeng et al., 2024) explains that interactions between students can help cognitive development, but in this context, the role of peers requires reinforcement. With the right training, peers can function as more effective mediators, so that the understanding gap can be reduced. The implications of these findings suggest the need for increased training for peers to optimize their role in supporting the learning engagement of deaf students.

Use of Professional Sign Language Teachers as the Primary Source of Interpretation

The study also found that professional sign language teachers play a very important role in ensuring deaf students can understand the learning content more effectively. However, the limited number of teachers who are experts in sign language poses a challenge for schools. One of the principals at school A explained, "In our school there are only a few teachers who are really good at sign language, so we have to divide their time very carefully so that all students have equal access." (Principal-1, October 2022).

In addition, a sign language teacher at school B said, "Although I can interpret sign language while teaching, it is challenging and requires a lot of focus. Ideally, there should be a separate translator who is fully responsible for helping deaf students." (Teacher-4, October 2022). Deaf students at school B stated that the help of teachers who understood sign language professionally made it easier for them to understand the lessons. "When the sign language teacher helps directly, I understand the lesson better than when I only have the help of a friend." (Deaf Student-5, October 2022).

Observations show that classroom learning sessions with the support of professional sign language teachers provide a better learning experience and higher student engagement. Teachers can provide clear instructions and respond directly to student questions, which is not the case when peers or non-professional teachers are on duty.

The following is a table showing the interactions between teachers, interpreters, and deaf students in vocational skills learning, illustrating the effectiveness of professional sign language teacher support in ensuring deaf students can actively participate and understand the material being taught:

Tabel 1. Interprets in Vocational Skills Lesson

Informant	Interpret
Teacher	Hello pupils, attention to you all! Look at me!
Teacher	What am I doing with this camera?
Interpreter	Who can answer this?
Hearing-impaired pupil (Pupil X)	I have an answer.
Interpreter	Yes, my pupil, could you please give your answer?
Teacher	Pupil X, welcome, please talk.
Hearing-impaired pupil (Pupil X)	You're taking a photo.
Teacher	Your answer is correct, class clap hands for Pupil X

The existence of professional sign language teachers is essential in creating an inclusive learning environment and supporting the involvement of deaf students. According to the theory of effective communication, accurate delivery of information requires mediators who have special competencies (Namanyane & Shaoan). Lack of professionals leads to access disparities, and these results highlight the need for long-term strategies to recruit and train sign language teachers in inclusive schools.

The implications of these findings reinforce the importance of communication qualifications for deaf students in obtaining equal educational rights.

The Use of Local Signs as an Alternative

The findings suggest that some teachers use simple local signs to help deaf students engage in learning activities, especially when there are no teachers or peers who master sign language. One of the teachers at school A stated, "We use signs such as 'take a book' or 'write' that can be understood by deaf students. Although it is simple, it helps them to stay engaged in classroom activities." (Teacher-5, October 2022).

A deaf student also gave a response about the use of this local sign. "Sometimes, teachers use easy-to-understand signs, so I can follow the lessons better, even if they don't really know sign language." (Deaf Student-3, October 2022). However, another teacher expressed concern that local signs are not always effective, especially in conveying complex concepts. "For lessons like math or science, local signs aren't helpful enough because a lot of technical terms are hard to explain." (Teacher-6, October 2022).

In addition, through observation activities conducted by the study, it was shown that these local signs were effective in informal situations and helped deaf students stay engaged to a minimum. However, in more abstract or technical lessons, the limitations of local signs become a significant obstacle. The use of local signs in supporting the learning of deaf students in the Inclusive Classroom is as shown in figure 1.

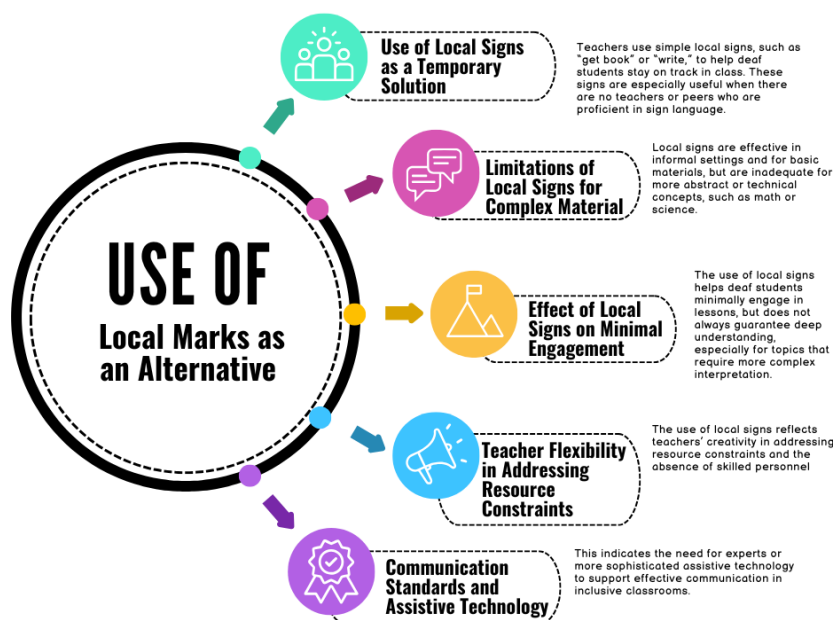


Figure 1. The Use of Local Signs in Supporting Deaf Student Learning in Inclusive Classrooms

This image shows the role of simple local signs as a temporary solution in supporting the involvement of deaf students in inclusive classrooms. These signs are effective for basic instruction such as "grab a book" or "write," which allows deaf students to stay engaged when a teacher or peer proficient in sign language is not available. However, the limitations of local signs appear in more technical lessons, especially in understanding abstract concepts and specific terms, thus reducing the depth of students' understanding. Teachers' flexibility in utilizing local signs reflects their creative efforts in overcoming resource limitations in inclusive classrooms.

The use of local signs demonstrates the flexibility of teachers in overcoming resource limitations, but also reflects that this method has limitations in supporting the comprehension of more complex materials. Based on the theory of social constructivism, interaction using local signs can be helpful in basic learning, but requires competent mediators for higher material (Partington et al., 2024). This indicates the need for better communication standards in inclusive classrooms, by providing experts or assistive technology capable of handling more difficult material.

Guest Speaker Engagement as an Additional Solution

Recent findings reveal that some schools use guest speakers from local education offices to help interpret sign language for deaf students, especially when sign language teachers are not available. Principal A explained, "We occasionally invite sign language experts from the education office, but this cannot be done routinely because they have other responsibilities." (Principal-1, October 2022).

A teacher at school B also said, "When we managed to invite guest speakers, learning became more effective. However, the challenge is that they are not always available when needed." (Teacher-2, October 2022). The deaf students interviewed admitted that the presence of a guest speaker improved their understanding, as one student stated, "When I have a guest who can sign language, I find it easier to follow the lesson." (Deaf Student-7, October 2022).

The results of observations made by the researcher showed that the session with guest speakers had a positive effect on the learning engagement of deaf students. However, the unavailability of guest speakers at certain sessions creates a dependency that makes these interventions less sustainable.

Collaboration with guest speakers as a temporary solution demonstrates the school's initiative in overcoming resource constraints, but also requires continuity. The theory of accessibility in education states that the role of external collaboration can help the success of inclusive education if it is available consistently (Ngobeni et al., 2020). The implications of these findings indicate the need for a management system that can ensure the presence of continuous interpretation services, such as the use of assistive technology programs or long-term partnerships with interpretation service providers.

This study highlights the importance of the role of sign language interpretation in supporting the learning involvement of deaf students in inclusive classrooms. which is in line with the findings of several previous

studies. Research by Kokorelias et al. (2024) shows that the availability of professional interpreters has a significant impact on the involvement and understanding of deaf students in inclusive classes, similar to the results of this study which found that dependence on peers or local signs as an alternative interpretation often causes limitations in the delivery of complex materials. In addition, a study from Dalgaard et al. (2022) revealed that deaf students in environments without consistent sign language interpretation tend to have lower participation rates, which underscores the need for competent experts to create a supportive learning environment.

These findings are also in line with the research of Freitas et al. (2022) which highlighted the importance of external collaboration, such as guest speaker engagement, to fill gaps in the availability of sign language teachers, although the practice needs continuity to be more effective. Thus, while various alternatives have been implemented, these findings underscore the urgency of experts and policies that focus on providing professional interpretation as a step to ensure educational equality for deaf students, in line with the principles of inclusive education set forth in the current literature.

In addition, this research makes a significant practical and theoretical contribution in efforts to improve the quality of inclusive education for deaf students. In practical terms, the findings of this study emphasize the importance of the presence of sign language professionals in inclusive schools, which plays a role in improving the accessibility and involvement of deaf students in the learning process. The recommendations resulting from this study, such as increased peer training and consistent use of guest speakers, offer direct solutions for educational institutions to address frequent resource constraints. Theoretically, this study expands the understanding of the effectiveness of various methods of sign language interpretation, ranging from peer roles to the use of local signs, and confirms that professional interpretation has a deeper impact on the understanding of complex concepts for deaf students. This research also enriches the literature on inclusive education by showing that social interaction and communication accessibility through appropriate interpretation are key in developing an equal learning environment for students with special needs, in line with the theory of social constructivism and the theory of effective communication.

CONCLUSION

The conclusion of this study shows that the application of sign language interpretation services in inclusive classrooms has a significant impact on the learning engagement of deaf students, especially when the support provided involves professionals. The main findings of the study revealed that although peers or local signs can be a temporary solution in aiding communication in inclusive classrooms, the presence of professional sign language teachers provides a much higher quality of interpretation and allows for a deeper understanding of the learning material. This indicates that the school's efforts in creating an inclusive learning environment need to involve trained personnel in sign language as part of a holistic approach to supporting the education of deaf students.

The lesson of this study is that the effectiveness of inclusive education does not only depend on intentions or policies, but on the implementation of practices that are directed and adapted to the communication needs of deaf students, which are in line with the theory of social interaction and communication accessibility in education.

This research contributes to the academic literature by updating perspectives in inclusive education through direct observation on the effectiveness of diverse sign language interpretation methods. By proposing the importance of professionals as the main source of interpretation, this study enriches academic understanding of the ideal inclusive education structure, and proposes an important role for governments and educational institutions to provide training for peers and teachers in sign language. Nonetheless, the study has limitations, including limited scope to cases in some schools and qualitative research methods that do not allow generalization of results. Further research is needed to explore other variables such as age differences, gender, and the influence of cultural factors in the application of sign language interpretation services. With further development, it is hoped that the results of this research can support the formation of inclusive education policies that are more appropriate and responsive to the needs of all students.

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