



Written Text as a Primary Access to Learning: A Study of the Experiences of Students with Hearing Impairments in Inclusive Higher Education

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ABSTRACT

Students with hearing impairments must have equitable access to education in order for higher education to be considered truly inclusive. This is particularly crucial in lecture settings where the primary mode of instruction is spoken communication. These days, written content such as presentation slides and subtitle is a typical form of assistance. Examining how well written materials can support students with hearing impairments in inclusive higher education settings is the aim of this study. Students' open-ended responses were analyzed in this study using a descriptive qualitative methodology. The findings demonstrate that written content is a significant source of information, facilitates independent review, and aids in lecture comprehension. However, the intricacy of scholarly language and the errors inherent in automatic transcriptions pose significant challenges. The usage of complicated and difficult-to-understand academic terminology, delays in subtitles, and the unreliability of automatic transcribing present serious difficulties. By demonstrating how crucial language clarity, material structure, and subtitle accuracy are to creating learning designs that are simpler for all students to understand, this study supports inclusive teaching practices. This study demonstrates that written language should not be regarded merely as an optional intervention, but rather as a fundamental component of inclusive, effective, and equitable learning processes. In this regard, it holds significant implications for educators, policymakers, and all stakeholders involved in the development and design of higher education curricula.

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INTRODUCTION

A global commitment that acknowledges each person's right to unfettered access to education is symbolized by inclusive higher education. Through the Convention on the Rights of Persons with Disabilities (CRPD), specifically Article 24, which requires all countries to guarantee that all educational levels are accessible to all people with disabilities, the UN emphasizes this principle (United Nations Convention on the Rights of Persons with Disabilities, 2006). In

order to guarantee equitable access to the educational process, this principle applies to both the admission of students with disabilities and the provision of reasonable accommodations in higher education.

Students with hearing impairments often struggle in lecture settings, where most communication is still verbal. According to Marschark and Hauser (2012), these challenges include the inability to access instructors' spoken explanations, class discussions, and simultaneous interactions, all of which are frequently essential to the learning process. Numerous studies have shown that deaf and hard of hearing students may not be able to participate in or learn as well in higher education if they do not have equal access to information (Lang, 2002; Richardson et al., 2010). Academic challenges may arise for students with hearing impairments if they do not receive appropriate access support (Michael, 2020; Winarsih, 2013).

Providing written content, such as presentation slides, automatic transcriptions, and subtitles, is a popular method of promoting learning. According to studies, students with hearing loss benefit from subtitles and transcriptions, which also help them comprehend and retain the information they learn from videos (Dommett et al., 2022; Gernsbacher, 2015). One of the most important ways to improve accessibility in learning, according to the Universal Design for Learning (UDL) framework, is to present information using visible text and other forms of representation (Locke et al., n.d.; Mayer & Trezek, 2019). This approach emphasizes that altering the way information is presented is a crucial component of inclusive learning design, not merely an add-on feature.

Previous research has demonstrated that the use of subtitles and transcriptions can aid students in comprehending, remembering, and maintaining their interest in the material being studied. This holds true for both other students and those who have hearing impairments (Brand & Dalton, n.d.; Gernsbacher, 2015; Mayer & Leigh, 2010). Students can retain more of what they hear, reread content, and process information at their own pace when they are exposed to written text. As a result, written language could be the primary means by which students with hearing impairments understand instructional materials. Written language is essential for deaf students to learn and understand academic material autonomously, particularly when they cannot hear or see it (Mayer & Trezek, 2019; Trezek & Mayer, 2019). Written text, including captions and transcripts, serves as a significant resource of information and facilitates the enhancement of language and literacy skills, which are essential for the academic success of deaf students (Birinci & Sariçoban, 2021; Swanwick & Marschark, 2010).

The effectiveness of the written text, however, also depends on how well it is written and how accurate it is. For example, automatically generated transcriptions often have mistakes in speech recognition, especially when it comes to technical or specialized academic terms. Students may find it difficult to comprehend the content as a result of these errors (Dommett et al., 2022). Additionally, students may find it more difficult to process information if the language used in written documents or on slides is too difficult to understand, particularly if there are no clear layouts or basic explanations of the material (Antia et al., 2009; Richardson et al., 2010; Sweller et al., 2011).

Access to written materials from the perspective of inclusive education refers to both their availability and the use of language that is understandable, well-structured, and clear. Helping students with special needs requires adhering to the principles of language clarity and reducing cognitive load (Fajardo et al., 2014; Inc, n.d.; Mayer & Trezek, 2019; Moraña, 2017; Sweller et al., 2011). Put another way, even though they are physically available, written materials that are linguistically complex could present a new challenge.

The effectiveness of Universal Design for Learning (UDL) and supplemental texts has been the subject of many studies, but there is currently a dearth of research that focuses on the experiences of students with hearing impairments using written materials in higher education, especially in developing countries. Most studies focus primarily on technology or policy, ignoring the use of students' voices and firsthand experiences as primary data sources (Marschark & Hauser, 2012; Moraña, 2017; Moraña et al., 2024).

This study is urgent because of the disparity between inclusive education policies and how they are actually implemented in higher education practices. The United Nations Convention on the Rights of Persons with Disabilities establishes an international legal framework that highlights the necessity of inclusive education systems. However, classroom implementation frequently fails to ensure equal access to communication (United Nations Convention on the Rights of Persons with Disabilities, 2006).

Research indicates that students with hearing impairments struggle to understand verbally delivered materials if they do not have the appropriate access strategies (Bintoro et al., 2022; Marschark & Hauser, 2012; Winarsih & Bintoro, 2019). Understanding the learning benefits of well-written texts is essential in a world that is becoming more digitally connected, reliant on online learning, and utilizing technologies for automated transcription. It is especially important to ensure that technology truly makes access easier rather than just following administrative protocols (Seale, 2013; Silvestri & Hartman, 2022; Yabe, 2024).

This study offers something new by focusing on the first-hand experiences of students with hearing impairments who learn primarily through written text in publicly accessible higher education. In contrast to previous research that mainly examined technological or policy factors, this study examines students' individual experiences with language barriers, transcription accuracy, and adaptation strategies (Dommett et al., 2022; Gernsbacher, 2015). This study employs thematic analysis of open-ended responses to better understand inclusive pedagogy and Universal Design for Learning (Mayer & Trezek, 2019; Seok et al., 2023) from an experience-based perspective. This offers theoretical and practical underpinnings for creating lecture materials that are more approachable and considerate of students' needs.

The objective of this study is to ascertain how written materials, including captions and presentation slides, can assist students with hearing impairments in understanding inclusive higher education. This study utilizes thematic analysis of student responses to provide empirical insights into the improvement of responsive and accessible learning practices for individuals with hearing impairments.

RESEARCH METHOD

This research utilizes a descriptive qualitative methodology underpinned by a framework for thematic analysis. This method was chosen to enhance the understanding and examination of the distinct experiences of students with hearing impairments who utilize written text for learning in inclusive higher education. Thematic analysis enables researchers to systematically identify recurring themes and patterns of meaning within narrative data (Braun & Clarke, n.d.).

Participants

Ten students with hearing impairments who attended an inclusive campus participated in the study. The group consisted of seven male students and three female students. Every participant had attended lectures that included presentation slides, written text, and automatic transcriptions as part of the learning process. Because the participants were carefully selected, they had to have firsthand experience using text in lectures.

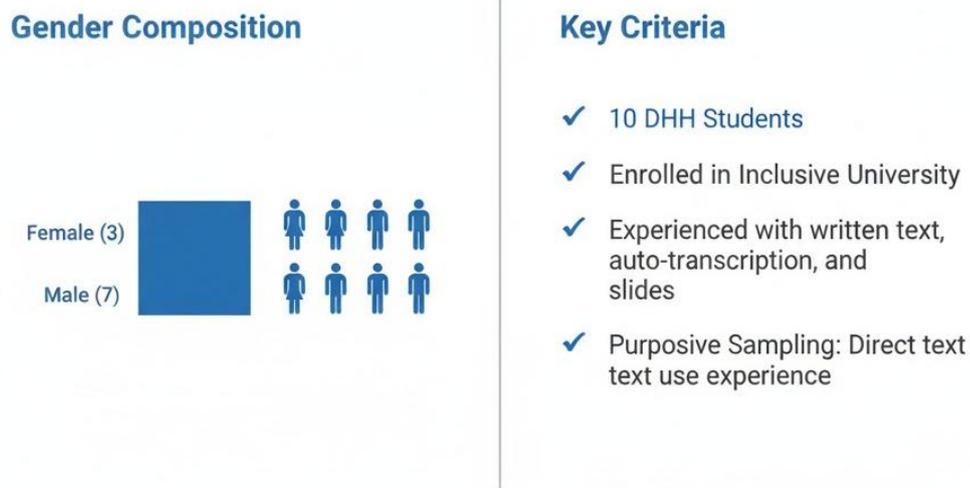


Figure 1.
Research Participant

Data Collection Technique

We used an open-ended questionnaire to learn how students felt about and used written text, such as slides and captions, to help them understand the material. Most of the questions were about how students dealt with problems and the pros and cons of using text-based resources. It was easier for everyone to read all of the answers.

Data Analysis Technique

We analysed the data using Braun and Clarke's six-step thematic analysis technique. Familiarizing yourself with the data, generating codes, searching for themes, reviewing themes, defining and naming themes and writing up are all essential. By not attempting to fit themes into predetermined categories, inductive coding allowed the themes to emerge directly from the data. The researchers re-read the transcript several times about themes and checked consistency within code for reliability of result before determining final theme.

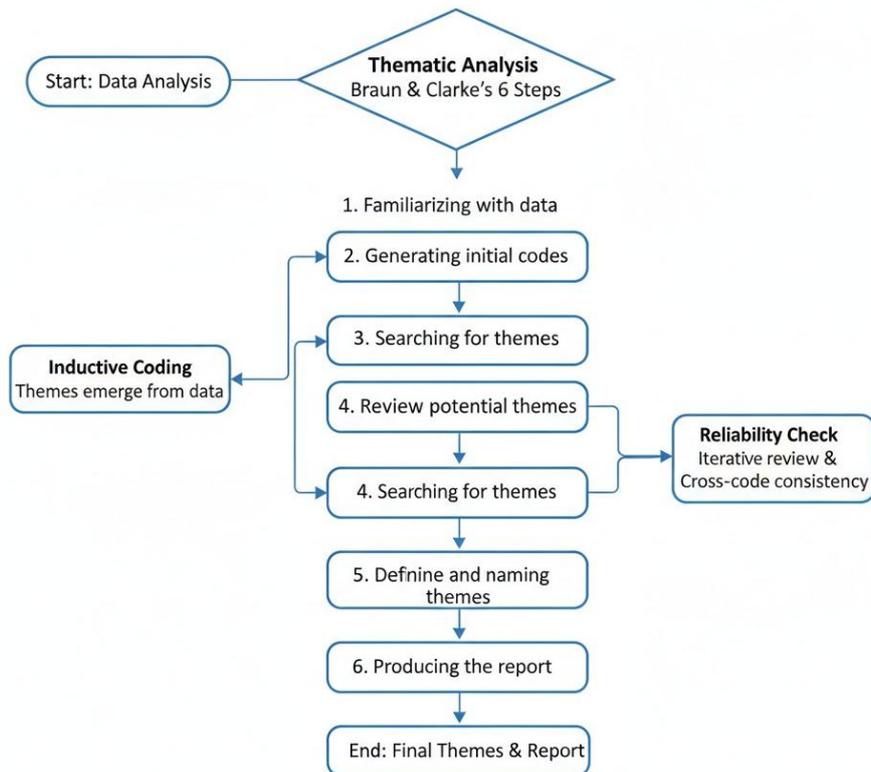


Figure 2.

Data Analysis Technique: Braun & Clarke Thematic Analysis

Ethical Considerations

The principles of data anonymity, individual's privacy and voluntary participation are respected by us in this study. Before the questionnaire, all participants received a written explanation of the aim and course of the study. Before using it, participants consented through a digital informed consent process with approval. All the data has been de-identified and used primarily for academic research.

RESULT AND DISCUSSION

Four major themes emerged from the thematic analysis of the use of written text (slides and captions) to assist students with hearing impairments: (1) written text as the primary information source; (2) self-regulated learning and repetition; (3) challenges with accuracy and language complexity; and (4) student-used adaptive strategies. The importance of written content in fostering equitable learning in inclusive classrooms is illustrated by these four themes.

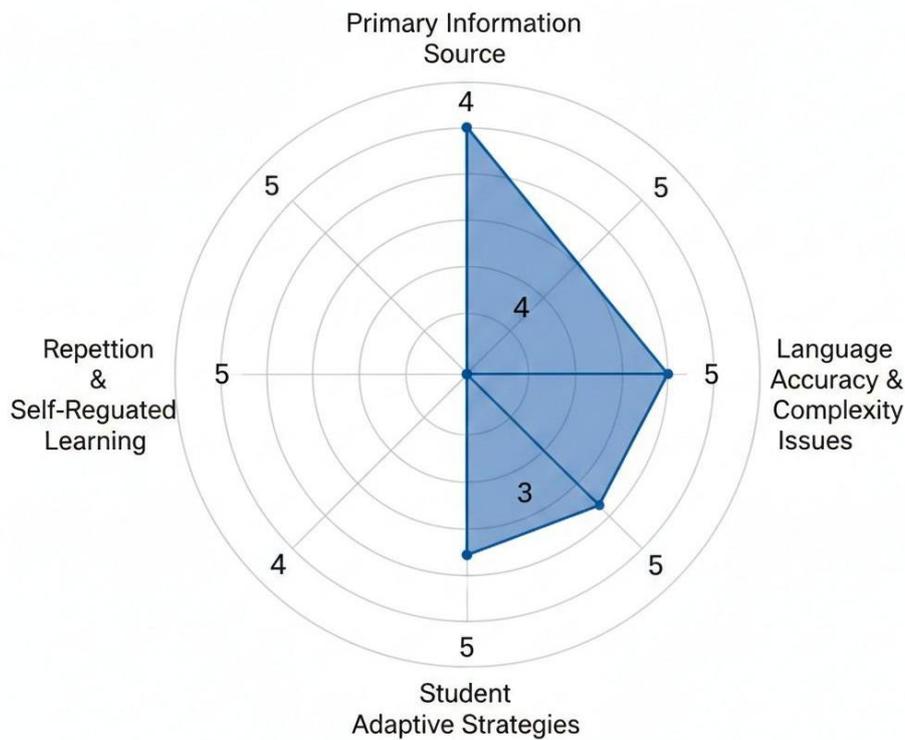


Figure 3.

Thematic Analysis: Functions of Written Text for DHH Students

The first theme illustrates that the main way to comprehend the course material is to read written materials. Several respondents explicitly mentioned that they use slides and captions as substitutes for auditory access. "More daring banyak yg manfaat pembelajaran materi kuliah," R2 stated. R3 emphasized that "techs tertulis sangat membantu karena menjadi sumber utama pemahaman yang saya dapat," whereas "online learning is easier because there are many benefits for understanding lecture materials." "Since written material is my main source of knowledge, it is very beneficial." These assertions imply that text is not merely a supplement to academic information, but rather its main source.

R8 backs up this conclusion by stating, "Teks tertulis memiliki peran yang sangat penting fori saya." "With the aid of the slide and caption, I am able to read, comprehend, and revisit the content. Written text is very important to me. With the aid of slides and captions, I am able to read, understand, and review the information. R10 made a similar statement: "Ya, saya bisa memahami meskipun saya tidak bisa mendengar suara hanya bisa membaca secara berulang ulang materi." "Yes, even though I can't hear the sound and can only

read the content repeatedly, I can understand." These results imply that written text replaces auditory information in students' cognitive processes.

The second theme is the use of text as a tool to control self-regulated learning. A few students talked about the importance of reading repeatedly and slowly. R9 said, "Harus dibaca pelan." The statement, "It has to be read slowly," suggests that everyone must take their time learning new material. Rereading facilitates reflection and improves memory retention.

In theory, these findings support principles of Universal Design for Learning (UDL), which emphasize the importance of presenting information in multiple forms to enhance accessibility. Providing students with reading material reduces the language requirement and allows them to regulate the speed of their study. Furthermore, previous studies show that captions benefit understanding in general and people who are deaf/hard of hearing specifically.

The third theme talks about problems with the quality of written texts, especially when it comes to the accuracy of automatic transcription. R4 said, "Transkripsinya tidak selalu akurat sehingga saya kurang memahami kosakata baru." R6 stated, "There are some words that are clear and some that are not so clear because the transcription isn't always accurate." "Some instant transcriptions are easy to read, while others are challenging." These kinds of mistakes can lead to misunderstandings and make it harder to understand academic ideas.

Additionally, language complexity makes things more difficult. "Teks tertulis jangan terlalu bahasa tinggi because I still don't understand," R5 stated. "Written material shouldn't use too complex language because I still don't understand." R7 even said, "Saya pemahaman 65%, karena ada yang aku belum tahu kata artinya," suggesting that their understanding was inadequate. "Around 65% of what I know is made up of words whose meanings I don't know." This illustrates that having text alone is not enough; presentation and language quality are also very important.

The strategies students use to get around access restrictions are the subject of the fourth theme. "Saya lebih memilih untuk bertanya kepada teman di samping saya agar mendapatkan penjelasan yang lebih jelas," R4 said. "I'd like to ask the friend seated next to me for a more thorough explanation." This strategy shows how peer support can help with comprehension when text alone isn't sufficient. This modification shows how well students can handle their own learning even when faced with obstacles.

Discussion

The study's findings indicate that students with hearing impairments feel more secure when written text is used in the classroom. Many participants

reported feeling less anxious about going to class after being able to review the content. These findings are consistent with research showing that giving deaf and hard of hearing students constant visual access to information can boost their academic engagement and sense of control (Marschark et al., 2015; Richardson et al., 2010). This illustration demonstrates how students' views of their academic aptitude, sense of self, and the cognitive and affective aspects of learning are impacted by text access. Regular access to written materials increases the likelihood that students will engage in the learning process. They consequently become less dependent on instantaneous interpretation from their environment.

As online learning becomes more popular, automatic text is becoming more common in digital learning settings. Nonetheless, studies demonstrate that inaccuracies in automatic speech recognition persist in educational contexts, and this technology does not fully guarantee linguistic precision (Carl et al., 2011; Dommett et al., 2022). Errors in transcription can cause misunderstandings that make it harder to learn, especially when they involve technical terms and academic jargon. Studies show that when students have to fix wrong information at the same time, text errors can make it harder for them to understand what they are reading (Mayer & Leigh, 2010). This means that accessibility technologies should be checked for quality on a regular basis instead of just having features..

Additionally, despite previous research highlighting issues with automatic speech recognition (ASR) accuracy, recent studies demonstrate that user-centered improvements and service user participation in validation processes can significantly improve the quality of captions in digital learning (Locke et al., n.d.). Collaborative approaches that involve both students and teachers in direct correction and language quality assessment can facilitate the identification of terminological errors and the customization of transcription results to particular academic contexts (Kuhn et al., 2025).

Higher education research indicates that better caption quality reduces cognitive load, facilitates comprehension, and encourages more active participation from students with hearing impairments in online discussions (Tannenbaum-Baruchi et al., 2025). As a result, caption quality evaluation ought to be viewed as an ongoing, adaptable process that incorporates user feedback and technological assistance that takes into account the linguistic requirements of various industries.

The results of this study support the idea that accessibility in higher education means more than just fair access to facilities and learning opportunities. This idea is in line with the United Nations Convention on the

Rights of Persons with Disabilities (2006a), which says that everyone has the right to an education. It also fits with inclusive teaching methods, which say that teachers should change how they teach to fit the needs of each student (Meyer et al., 2014).

Gernsbacher (2015) also demonstrates that creating departments, classrooms, labs and learning spaces that are easy to access benefits more than just people with disabilities. But automatic subtitles and other accessibility tech don't always quite nail the language, certainly not when it involves technical or academic verbiage. Students might need to spend more time trying to make meaning from concepts, as digestion will have been compromised by transcription errors (Carl et al., 2011; Dommett et al., 2022; Mayer & Leigh, 2010). This means that simply adding whatever new technology comes along will not ensure that students get accurate and complete information; the protocols by which the content is reviewed and evaluated need to change as well. Researches have shown that incorrect subtitles can either affect the student's interest and attentiveness to online contents (Gernsbacher, 2015). This illustrates how crucial it is to marry good technology and good teaching design.

The importance of clear, well-structured language gives an indication of how cognitive load should be low when writing. If the slides or captions use indirect language without providing clear explanations, students may feel they have more information than they can absorb.

Accordingly, they find it difficult to assimilate new data. According to cognitive load theory, reducing the linguistic aspect and breaking down the information into small pieces are two important principles for increasing understanding (Sweller et al., 2011). These findings are in line with those of Marschark and Hauser (2012) who highlight that students with hearing loss may also experience difficulties in understanding academic language.

The results of the study highlight how important it is to improve educators' capacity to create inclusive, text-based learning materials. Creating slides and captions is not enough for lecturers. Additionally, they must ensure that the transcription is accurate, that the terms are used consistently, and that everything is understandable. Any misunderstanding can be resolved with succinct, straightforward language. Furthermore, it may be simpler to continuously assess the efficacy of written instructional materials if student feedback tools are included.

Findings of the research also indicate that the experiences of students who are deaf new signers in developing countries as well still are largely under-represented. In many of the studies conducted in this field, structural or

technological considerations and/or policy-related matters are often preferred over those shared by the main stakeholders themselves: students (Marschark et al., 2015; Moriña, 2017; Moriña et al., 2024). Therefore, this study emphasises the value of strategies that engage students in the design and assessment of accessibility. Such approaches can help to identify real needs, address knowledge gaps and promote inherently inclusive learning environments.

These new findings shed light on the role of written text in universally accessible higher education systems. However, the effectiveness of the system is heavily influenced by the teacher's ability to instruct and meet the needs of the students. Higher education institutions can develop pedagogical approaches that are not only technically possible but also academically significant and structurally equitable by concurrently integrating the ideas of universal design, educational rights, and cognitive load management.

CONCLUSION

This study suggests that written resources, such as slideshows and captions, are essential for improving the comprehension of students with hearing impairments in inclusive higher education. The main finding demonstrates that written text replaces spoken language as the primary information source, allowing students to assess and control their own learning while reducing the likelihood of misconceptions caused by limited auditory access. However, the text's quality, such as the accuracy of the automatic transcription and the language's complexity becomes a critical factor influencing students' comprehension.

The contribution of this study is divided into two sections. By utilizing students' real-world experiences as a basis for developing educational materials, this study conceptually emphasizes how important it is to integrate inclusive pedagogy and Universal Design for Learning principles. This study's methodology demonstrates that thematic analysis and descriptive qualitative approaches are useful instruments for examining the experiences of students with sensory impairments. This helps to build a framework that can be used or extended in various higher education contexts.

But there's a whole lot wrong with this study. Several limitations, including the small sample size and a single institution; made it difficult to apply these findings to other scenarios. Further, the study focused only on students' views and not lecturers or other academic members in analysing the learning ecosystem. Directions for further research include expanding the sample to cover more institutions, including instructor perspectives, as well as

evaluating the effectiveness of transcription tools and WCD in an online/face-to-face environment.

This research illustrates that written language is more than an optional intervention for inclusive, effective and equitable learning processes. This, in turn, is crucial for teachers and lawmakers and all the people who make higher education curricula.

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