



## Designing Instructional Media for Deaf and Blind Students : Promoting Inclusivity and Equity

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**Abstract:** This study aims to design specialized instructional media for college students with hearing and visual impairments, supporting their unique learning needs. This study used a qualitative single-case study approach to thoroughly investigate the experiences of deaf and blind college students, with a focus on instructional modules and videos. The research subject is college students with hearing and visual impairments, specifically examining their higher education experiences and identifying specific requirements for effective learning. This research instrument uses surveys, interviews, and analysis of instructional modules and videos to gather comprehensive data on the challenges and needs of deaf and blind college students. The data were analyzed using thematic analysis to identify patterns, themes, and insights related to the higher education experiences of students with hearing and visual impairments. The results of this study indicate that the design and implementation of specialized instructional media with tailored features significantly contribute to addressing the unique challenges faced by deaf and blind college students. This approach fosters inclusivity and equity, providing valuable insights for creating more effective and accessible online learning materials in higher education.

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## Introduction

Inclusivity in education holds great significance as it fosters an educational environment that is open and accommodating to all students, irrespective of their backgrounds, capabilities, or physical and mental conditions (Avramidis et al., 2000). The concept of inclusive education is often linked to the needs of individuals with disabilities and the interplay between specialized and general education (Alexander & Byrd, 2020). Since 1990, the efforts made by individuals with disabilities have contributed to a global shift in how inclusion is perceived in education, leading to the acknowledgement of the right to inclusive education, as outlined in Article 24 of the 2006 United Nations Convention on the Rights of Persons with Disabilities (Miles & Singal, 2010). However, as elucidated in the Indonesian Republic Law No. 8 of 2016 concerning this matter, the scope of inclusion extends beyond its conventional bounds (Millati, 2016). Inclusive education entails a system and environment that recognizes the diversity and multifaceted requirements, as has been underscored during the Covid-19 pandemic (Muafiah et al., 2021). Standards and societal outlook play a pivotal role in establishing norms, shaping regulations, and viewing distinctions as innate. The notion of hindrances to participation and learning should supplant the notion of distinctive needs (Bacq et al., 2020).

Inclusive education caters to all children, irrespective of their conditions, encompassing physical, intellectual, emotional, social, or other conditions (Hidayat et al.,



2023). Among the children with special needs entitled to learn alongside their typically developing peers are those who are deaf and blind. Deafness refers to a condition wherein an individual experiences partial or total hearing loss (Diego & Hardonk, 2023). The degree of hearing loss among deaf individuals can vary, spanning from challenges in hearing soft sounds to complete auditory impairment (Moore et al., 2021). Deafness can influence one's verbal communication, comprehension of conversations, and participation in social interactions (Widiana et al., 2019). The origins of deafness are diverse, including genetic factors, infections, injuries, or excessive exposure to loud noises that damage hearing (Nieman & Oh, 2020). Deaf individuals commonly employ communication techniques such as sign language, lip reading, or hearing aids to engage with their environment (Tat et al., 2021). Blindness denotes a condition wherein an individual experiences partial or complete vision loss. The extent of vision loss among blind individuals can range from blurred or restricted vision to complete blindness (Presti et al., 2019). Blindness can impact daily activities, spatial orientation, and social participation. A myriad of factors can contribute to blindness, including genetics, eye ailments, injuries, or other medical conditions that impair vision (Denisrum, 2007). Blind individuals often rely on aids such as canes or guide dogs and acquire specialized techniques for navigation and communication in their unseen surroundings (Kuribayashi et al., 2022) (Vincenzi et al., 2021).

Facilitating education for students with special needs presents unique challenges. At Universitas PGRI Argopuro Jember, which hosts 170 students with disabilities with the criteria of physical disabilities, visual impairment, hearing impairment, and speech impairment. Generally, individuals with physical disabilities face fewer obstacles in the learning journey. In contrast, students who are deaf and blind encounter substantial challenges in accessing visually-oriented learning materials. For instance, deaf students may grapple with comprehending video content, while blind students confront difficulties accessing visual data in presentations lacking interpretable alternative text. A considerable portion of blind students face obstacles in accessing materials presented in inaccessible formats like PDF files or images in JPG format. Moreover, screen readers relying on auditory capabilities cannot be equated with traditional reading skills. Blind students require more time to read and/or listen to materials, as they handle assignments or engage in lectures (Jackson & College, 2021). The formatting requirements for assignments also present challenges, given blind students' limited ability to structure written content according to anticipated formats without visual cues (Ika Febrian Kristiana, 2021). Hence, a substantial disparity exists in the challenges encountered by individuals who are deaf compared to those who are blind in terms of accessing learning materials and completing academic tasks (Kodiango & Syomwene, 2016).

The process of inclusive education entails interdependent components that collectively contribute to achieving the desired educational objectives (Bedregal-alpaca et al., 2020). The first component revolves around the teaching staff. The second entails a flexible curriculum designed to accommodate diverse needs and abilities. The third component focuses on employing a varied learning approach. This encompasses methods, media, and learning resources tailored to suit students' capabilities and requirements (Y. Yunita & Elihami, 2021).

Recent research, as evident in various studies, emphasizes the critical need for innovative learning approaches tailored to the unique needs of deaf and blind students. The existing literature, such as the study on the development of an adaptive learning media for students with hearing impairments, and the comparative analysis of attitudes of blind and deaf students towards adapted learning platforms, provides a foundation.



The novelty of the current research lies in its comprehensive exploration of assistive e-learning interfaces and the identification of learning styles among students with visual and hearing impairments. Furthermore, the study addresses the suitability of online higher education for learners with disabilities (V. M. Yunita & Kristiyanto, 2021), shedding light on the motivations and expectations of students with impairments in an online educational model (Anwar & Wahid, 2021). It contributes by providing a detailed analysis of technological challenges hindering the learning experience for deaf students in online environments. Instructional modules and videos serve as potential learning aids that can function as alternative teaching tools for these students (Muallifah, 2021). Hence, the study aims to devise instructional media that can be harnessed as effective learning resources for deaf and blind students, taking into consideration essential aspects as perceived by the students themselves.

### Research Method

This research employs a qualitative single-case study approach (Ozcan et al., 2017) to investigate the implementation of Design Thinking in developing inclusive learning media for 170 college students with disabilities. The study is conducted in several phases:

- 1) Empathy: In-depth interviews with deaf and blind students are conducted to understand their unique learning challenges and preferences for instructional media.
- 2) Definition: Data from the empathy phase are analyzed to identify common patterns of challenges faced by the students. Focus groups with students are formed to gather further input on their priorities in media development.
- 3) Ideation: Brainstorming sessions involve a diverse development team comprising designers, educators, assistive technology experts, and student representatives. Various solution ideas, including technology utilization, interactive approaches, and accessibility strategies, are generated.
- 4) Prototyping: The development team creates learning media prototypes based on selected ideas, which may include a mobile application with accessibility features, a digital book with adjustable audio content, or a physical device with a braille display. These prototypes are used to obtain early feedback from educators and students.
- 5) User Testing: Learning media prototypes are tested with deaf and blind students as research subjects. Their interactions with the prototypes are observed, and feedback is collected.
- 6) Data analysis employs a thematic analysis approach on qualitative data from interviews, focus groups, and user testing to identify common themes and patterns related to the students' challenges, proposed solutions, and feedback on the prototypes.

The research findings will offer practical guidance for instructional media developers and educators, assisting them in designing inclusive solutions. The research's implications center on enhancing accessibility and the quality of learning experiences for deaf and blind students in higher education, ultimately contributing to a more inclusive educational environment.

### Results and Discussion

The research findings indicate that students with disabilities encounter various significant challenges in the learning process, which, in turn, can have a notable impact on their levels of motivation, engagement, and academic achievements. These challenges encompass factors such as inadequate accessibility, limited support, and a lack of alignment between the learning design and their specific needs. The repercussions of these constraints permeate into psychological aspects and academic performance of the students, posing

additional hurdles to achieving success in higher education.. The lack of equal access to learning materials, social interactions, and support resources can pose significant barriers in their educational journey. Therefore, a holistic approach that focuses on students as individuals with unique needs is essential.

Through a deep understanding of these challenges, this research is expected to provide a meaningful contribution to formulating effective and inclusive solutions. The Design Thinking approach is utilized to develop instructional media that aligns with the needs of students with disabilities. By comprehending the challenges encountered by these students in-depth, the development of innovative and inclusive solutions becomes more attainable. The challenges of students with disabilities in learning are presented in the following table:

**Table 1. Main Challenges of Students with Disabilities in Learning**

No	Challenges of students with disabilities	Frequency	Percentage
1	Communication barriers	30	17.6%
2	Material accessibility	25	14.7%
3	Social interactions	20	11.8%
4	Technological limitations	35	20.6%
5	Limited internet access	15	8.8%
6	Dependence on interpreters	18	10.6%
7	Difficulty accessing printed materials	10	5.9%
8	Lack of faculty support	12	7.1%
9	Non-inclusive learning environment	22	12.9%
10	Insufficient technology training	13	7.6%
11	Limited field activity participation	8	4.7%
12	Incompatibility of learning tools	20	11.8%
13	Restricted library access	7	4.1%
14	Insufficient alternative teaching materials	14	8.2%
15	Low awareness among peers	9	5.3%

Table 1 portrays the results of the analysis regarding the primary challenges faced by deaf and visually impaired students in the context of learning. Out of a total of 170 students who were subjects of the study, several patterns of challenges emerged with varying frequencies. Discussion of Table 1 involves an in-depth analysis of each identified challenge. This data provides critical insights into various aspects that need to be considered in developing inclusive instructional media for deaf and visually impaired students. From here, relevant solutions can be generated to address these challenges in the subsequent stages.

In order to develop effective learning media, it is important to conduct a thorough analysis of the needs, context, and learning objectives. Identifying potential solutions assists developers in designing a richer learning experience that aligns with the demands of the current era and technology. Identifying potential solutions also aids in understanding the existing learning needs. By identifying the issues or challenges to be addressed, developers can design learning media that specifically tackle those problems. Solutions tailored to the needs will enhance the effectiveness of the learning process.

**Table 2. Potential Solutions in Developing Learning Media**

No	Potential Solutions	Frequency	Percentage
1	Voice-enabled mobile application	50	29.4%
2	Digitally adaptable voice-enabled books	40	23.5%
3	Braille display on devices	30	17.6%
4	Technology training for students	25	14.7%
5	Instructional materials in accessible formats	35	20.6%
6	Instructional materials in sign language	20	11.8%
7	Enhancing faculty support	15	8.8%



8	Inclusive learning environment	28	16.5%
9	Accessibility awareness application	10	5.9%
10	Collaboration with researchers in this field	12	7.1%

Discussion of Table 2 reflects a variety of solutions generated through the ideation process. Each solution is designed to address specific challenges faced by deaf and visually impaired students. These solutions lead to the development of more inclusive, interactive, and responsive learning media tailored to individual needs. It is essential to identify the most relevant and realistic solutions for developing effective learning media (Wargadinata et al., 2020). In the next phase, these solutions will be tested, refined, and implemented in the design of appropriate learning media.

Discussion of Ideation, Prototyping, and User Testing After going through the stages of challenge analysis and ideation in the Design Thinking approach, the next step is to design prototypes of the potential solutions (Brown, 2008). These prototypes will be tested with actual users, namely deaf and visually impaired students, to obtain valuable feedback. The following is a discussion of these stages:

**Ideation** : The ideation stage involves a development team comprising designers, educators, assistive technology experts, and representatives of deaf and visually impaired students. Brainstorming sessions result in various potential solutions to address the challenges. These solutions include the development of voice-enabled mobile applications, digitally adaptable books, braille displays on devices, technology training, accessible instructional materials, and more.

**Prototyping** : Based on the ideas generated during the ideation session, the development team designs representative prototypes of the learning media. These prototypes could be initial models of mobile applications, sample digital books with voice features, or physical devices with braille displays. The goal of this stage is to generate initial feedback on the proposed solutions before their full implementation.

**User Testing** : The prototypes of the learning media are then tested with deaf and visually impaired students who are the subjects of the study. User testing aims to gain a further understanding of user responses to the proposed solutions and identify aspects that need improvement. During user testing, observations are made of student interactions with the prototypes, and feedback is collected through interviews or questionnaires.

The results of user testing will provide valuable insights into the effectiveness, usability, and potential issues in implementing these solutions. User feedback will help identify necessary improvements before the solutions are fully implemented. The ideation, prototyping, and user testing stages are crucial parts of the Design Thinking approach. In the context of this research, these stages allow developers to gain direct perspective from end-users, namely deaf and visually impaired students, resulting in solutions that better match their needs and provide a more enhanced learning experience.

### **Video for the Deaf and Hard of Hearing**

Text in Video for Deaf and Hard of Hearing Individuals In the context of deaf and hard of hearing individuals, text in videos plays a crucial role in providing accessibility. Two forms of text used in videos are subtitles or dialogue translations, and closed captions or background translations. Both have distinct roles and functions. Subtitles are a form of text that describes spoken dialogue or monologue in a video (Alonzo et al., 2022). Meanwhile, closed captions provide additional information involving sounds or events beyond dialogue,



such as environmental sound effects (Alonzo et al., 2022). Closed captions are often used to provide detailed context and atmosphere of scenes. Key Aspects in Text Placement The placement of subtitles and closed caption text requires careful consideration of several aspects:

- 1) Dark Background, Bright Text Colors (White and Yellow): Subtitle and closed caption text should be placed on a dark background, such as black or dark gray, to enhance contrast and readability. Recommended text colors are bright white or yellow.
- 2) Arial Font: Font selection impacts text readability. Use the Arial font because it is easy to read and has a clear design.
- 3) Font Size 30-50 Points: The optimal font size for subtitle and closed caption text ranges from 30 to 50 points. This size ensures clear readability even on smaller screens.
- 4) Transparent Background 70%-80%: To ensure readability, the text background can be given a transparency level between 70% and 80%. This helps integrate the text with the video content without disrupting the overall visual display.

The use of subtitles and closed caption text not only enhances accessibility for the deaf and hard of hearing but also provides a better viewing experience for all audiences. By considering the text placement aspects mentioned above, videos can be enjoyed more effectively by all types of viewers.

### **Sign Language Interpreter**

The Use of SLI in Videos In the context of videos, Sign Language is often used to replace auditory elements. Sign Language Interpreters (SLIs) play a crucial role as message conveyors through Sign Language (O'connell & Lynch, 2020). According to Tempo Diffable, the roles of SLIs include translating spoken language into Sign Language and vice versa. SLIs also need to select appropriate words or expressions to ensure accurate and easily understandable information for individuals with hearing disabilities (Mukrimaa et al., 2016). When utilizing SLIs, several important considerations are:

- a) Using SLIs is more suitable for videos with durations of 3-5 minutes that mostly contain narration or monologue (e.g., campaign videos).
- b) SLIs can be used in conjunction with subtitles and closed captions to accommodate various needs of the deaf and hard of hearing.
- c) Videos with durations longer than 6 minutes that involve multiple characters and dialogues (such as short films) should avoid using SLIs as it becomes challenging to interpret diverse dialogues.
- d) Ideally, an SLI should be a person with hearing disabilities who possesses expertise in the field.
- e) SLIs should be involved in discussions with the video production team.

### **Placement of SLI in Videos**

The placement of SLI in videos should take into account the following aspects:

- a) SLI wears plain clothing with dark and flat colors such as black, gray, or navy blue.
- b) The background for SLI is blue, or it may not need attention if SLI is using a green screen.
- c) The appearance of SLI ranges from the abdomen to the upper head to allow hand movements to be clearly visible.
- d) The distance between the top of SLI's head and the upper frame edge (headroom) is a minimum of 3 fingers.
- e) The SLI frame is positioned in the bottom right corner of the screen.
- f) The SLI screen is in landscape format (horizontal).
- g) The minimum size of the SLI screen frame is 20% of the screen size.



## Video for the Visually Impaired

Peer support plays a crucial role in delivering narration in videos for individuals with visual impairments. The role of this narrator goes beyond conveying messages; they also act as companions who vividly describe visual information. Several points to consider when involving peer support in videos are as follows:

- a) **Visual Description:** Peer supporters are responsible for explaining visual information present in the video, enabling individuals with visual impairments to better understand it. This allows visually impaired audiences to perceive and comprehend visual content through narration.
- b) **Availability of Transcript Documents:** Besides narration, ensure that transcript documents in digital format are also provided. These documents can be attached alongside the video to enhance accessibility for visually impaired individuals. The transcript documents will serve as vital references for those who want to access the message's content in written form.

Peer support plays a crucial role in ensuring that information in videos is accessible and well-understood by individuals with visual impairments. Through effective narration and visual description, videos become more inclusive, offering opportunities for all audiences to experience content in a more meaningful way. Moving forward, implementing these guidelines in video production will significantly benefit visually impaired individuals and contribute to creating a more inclusive media environment.

## Conclusion

The results of this study conclude that the design and implementation of specialized instructional media, incorporating tailored features, significantly contribute to overcoming the unique challenges faced by deaf and blind college students. This approach promotes inclusivity and equity in higher education, offering valuable guidance for the development of more effective and accessible online learning materials.

## Recommendation

Diversifying inclusive approaches beyond media development, such as exploring teaching methods, curriculum materials, or the utilization of advanced technology, is encouraged for future research. This would offer more holistic solutions to creating a genuinely inclusive learning environment. Expanding the research to different educational levels, including primary and secondary education, is recommended. This would allow a more thorough exploration of inclusive practices across various educational stages. Leadership at the campus level can support research initiatives that extend beyond the formal education context, including non-formal education settings like job training or lifelong learning. This broader perspective can contribute to developing more comprehensive inclusive strategies. Encouraging interdisciplinary collaboration among faculty and researchers is advised. Such collaboration can bring diverse knowledge and insights, enriching inclusive research that can have a positive impact on the entire academic community. Providing support for faculty development in designing and delivering inclusive learning materials responsive to the needs of students with disabilities is crucial. This may involve training in the use of accessibility technology and inclusive teaching strategies. Implementing these recommendations is expected to enhance inclusivity efforts in the academic environment and contribute positively to students with various disabilities.



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