A Classroom for All: Innovative UDL-Based Instructional Models and Media for Students with Disabilities

Fajar Indra Septiana[1] Emay Mastiani[2] Lilis Suwandari[3] Eka Yuli Astuti[4] Dwi Endah Pertiwi[5] Hendri Abdul Qohar[6] Siti Rachmah[7] Ahmad Mugni Almarogi[8]
Department of Special Education, Faculty of Teacher Training and Education, Universitas Islam Nusantara[1,2,3,4,5,6,7,8]
Email: fajarindraseptiana@uninus.ac.id[1] emaymastiani@uninus.ac.id[2]
lilissuwandari@uninus.ac.id[3] ekayuliastuti@uninus.ac.id[4] dwiendahpertiwi@uninus.ac.id[5]
hendriabdulqohar@uninus.ac.id[6] sitirachmah296@gmail.com[7] amalmarogi@gmail.com[8]

Abstract
This study aims to develop an inclusive learning model and media based on Universal Design for Learning (UDL) for blind and deaf-mute students in the Special Education Study Program, Faculty of Teacher Training and Education, Universitas Islam Nusantara. The study uses a qualitative descriptive approach and follows the ADDIE development model. Data were collected through needs assessment, interviews, and observation. The results show that blind students require auditory-based media compatible with assistive technologies, while deaf-mute students require media emphasizing visuals and text. The developed products include accessible digital modules and captioned videos usable by all students. The study concludes that a UDL-based learning design effectively accommodates the diverse needs of students in an equitable and inclusive manner.
Keywords: Universal Design for Learning, Students With Disabilities, Inclusive Learning

INTRODUCTION

Students with disabilities often encounter various barriers in pursuing higher education, ranging from physical inaccessibility to limitations in academic support systems (Rahma, 2024). One of the most commonly reported challenges is the lack of accommodation for their needs during learning processes, particularly in the form of digital course materials that are incompatible with the assistive technologies they use. For instance, course materials may not be readable by screen reader software used by students with visual impairments. There are also challenges related to inadequate learning accommodations, where instructional design fails to consider the individual needs of students with disabilities. For example, video-based learning materials frequently lack sign language interpretation or captions (Septiana & Effendi, 2019). Such conditions are also experienced by students with visual and hearing-speech impairments enrolled in the Special Education Program at the Faculty of Teacher Training and Education, Universitas Islam Nusantara. These circumstances underscore the critical role of higher education institutions—particularly lecturers—in intervening to accommodate the conditions and needs of students with disabilities in the learning process, ensuring they have inclusive and full access to participate effectively.

Students with visual and hearing-speech impairments have specific needs that must be addressed to enable active engagement in university learning environments. Students with visual impairments require learning materials that can be accessed through assistive technologies such as screen readers, audio books, or braille formats (Nisbet, 2020). Visual content, including images, graphs, and tables, should be accompanied by narrative descriptions to ensure complete information delivery. Furthermore, flexible evaluation methods and academic support are essential to facilitate comprehensive understanding of course materials.

Meanwhile, students with hearing-speech impairments need access to information in visual and written text formats. Audiovisual materials used in teaching should include captions or sign language interpreters (Subasno & Hitipeuw, 2023). Classroom communication must also be adapted to support visual interaction, ensuring proper lighting and clear articulation by lecturers. In some cases, alternative written communication is necessary, both during discussions and examinations (Ackah-Jnr & Danso, 2019). Both groups require an inclusive and responsive learning system that caters to their unique characteristics, allowing them to study independently, meaningfully, and on equal footing with their peers.

To meet the learning needs of these students, the present study aims to develop a learning model that not only accommodates the needs of students with visual and hearing-speech impairments but is also universally accessible to all students participating in the course. Previous studies have consistently shown that students with disabilities in higher education continue to face significant challenges in accessing equitable learning experiences. Moriña and Carballo (2017) emphasized that although many higher education institutions have adopted inclusive policies, implementation at the classroom level often fails to adapt to the needs of students with disabilities. These challenges primarily arise from inaccessible learning materials, limited pedagogical adaptation, and insufficient assistive technology support. Similarly, Al-Azawei, Serenelli, and Lundqvist (2016) found that a majority of university lecturers lack awareness of inclusive pedagogical strategies, which hampers the participation of students with sensory disabilities, such as those who are blind or deaf.

This gap is further compounded by the limited number of studies in Indonesia that develop and implement learning models based on Universal Design for Learning (UDL) principles. Existing research tends to focus on identifying barriers or exploring perceptions of inclusive education among lecturers and students, with little advancement toward the implementation of concrete and systematic instructional interventions (Irvan, 2017; Feriani, 2017; Sastradiharja & Sutarya, 2020; Muhibbin & Hendriani, 2021; Pradana, 2024). As such, there remains a research gap in developing inclusive and evidence-based instructional models, particularly those targeting students with visual and communication disabilities in higher education settings. This study contributes two key novelties to the field. First, the researcher has developed and implemented a UDL-based instructional model in a thesis supervision course within the Special Education Program at the Faculty of Teacher Training and Education, Universitas Islam Nusantara. In this course, students with visual and hearing-speech impairments actively participated alongside their non-disabled peers. The learning model was designed to accommodate diverse learning needs through differentiated media, instructional methods, and evaluation strategies. Second, the researcher has also developed assistive learning materials, including digital modules compatible with screen reader software and instructional videos with captions, as a concrete application of UDL principles. Through this approach, the study aims not only to provide accommodations for students with disabilities but also to establish a learning system that is inclusive and accessible to all students. In other words, this study shifts the focus from mere accessibility to ensuring equity and active engagement for all learners in academic processes. Therefore, this research is expected to serve as a reference point in the development of inclusive learning systems based on UDL in higher education contexts across Nation.

RESEARCH METHODS

This study employed a qualitative approach and a descriptive method, aiming to provide an in-depth account of the development and implementation processes of a learning model and media grounded in Universal Design for Learning (UDL) principles. This approach was selected

to capture the contextual dynamics of learning needs, experiences, and engagement among both students with and without disabilities in higher education settings (Teherani et al., 2015). The research adopted the ADDIE model—Analysis, Design, Development, Implementation, and Evaluation—as a framework for instructional design (Maydiantoro, 2021). In the analysis phase, the researcher identified learning needs and barriers experienced by students with disabilities through observations and interviews. These findings informed the design of a flexible and accommodative learning model. The design and development stages were conducted collaboratively, incorporating input from students, course instructors, instructional media experts, and specialists in disability-inclusive pedagogy, including representatives from the Indonesian Association of Orthopedagogical Educators (APOI). The implementation phase took place in a thesis supervision course within the Special Education Program, Faculty of Teacher Training and Education, Universitas Islam Nusantara, involving three student groups: students without disabilities, students with visual impairments, and students with hearing-speech impairments.

Data collection utilized several research instruments as outlined by Flick (2017). Semi-structured interview guides were used to explore the learning experiences of students with disabilities and to assess their perceptions of the developed model and media. Interviews were also conducted with course instructors and subject matter experts for content validation. Observation sheets documented students' engagement during the learning process, particularly in terms of interaction, access to materials, and responses to the learning model and media. Expert validation checklists were employed to evaluate the accessibility, pedagogical alignment, and technical feasibility of the developed instructional tools. Documentation, including field notes, photographs, screenshots, and recordings of learning activities, supported the triangulation of data from interviews and observations. The collected data were analyzed using thematic analysis. The process included data reduction by filtering relevant information from raw data, categorizing data into major themes such as learning needs, access barriers, and media effectiveness, and interpreting data to derive meaning and implications based on UDL principles. Triangulation was applied by cross-checking findings from interviews, observations, and documentation to enhance the validity of the results (Flick, 2017). Through this methodological approach, the study not only produced inclusive instructional models and media, but also contributed conceptually to the advancement of inclusive teaching practices in higher education that are more responsive to student diversity, particularly for those with visual and communication impairments.

RESEARCH RESULTS AND DISCUSSION

The findings of this study illustrate a gradual process in the development of an inclusive learning model and media based on Universal Design for Learning (UDL), beginning with the needs analysis phase and continuing through its initial implementation in the learning process. During the needs analysis phase, the researcher conducted an initial assessment of two groups of students with disabilities—those with visual impairments and those with hearing-speech impairments—to identify their specific needs in the learning process. This assessment was carried out through in-depth interviews and observations of previous learning activities. The results revealed that students with visual impairments require learning media that are auditory in nature, easily accessible, and compatible with the assistive technologies they use, such as screen readers, text-to-speech software, and appropriately formatted digital files. They also emphasized the importance of systematically structured material accompanied by clear verbal explanations to facilitate independent understanding. Meanwhile, students with hearing-speech impairments expressed their primary need for strong visual information support. They

require learning media enriched with visuals such as diagrams, illustrations, and videos supplemented with closed captions or other visual aids. Regarding instructional approaches, both groups of students highlighted the importance of differentiated learning strategies that allow them to engage in learning experiences tailored to their individual characteristics and needs. They reported that conventional, one-way teaching methods often hinder their comprehension and expressed a preference for interactive, multimodal approaches that offer flexibility in how they receive and express understanding.

Tabel 1. Learning Needs and Media Accessibility for Students with Visual and Hearing-Speech Impairments

Aspect	Students with Visual Impairments	Students with Hearing-Speech Impairments
Accessibility of Learning Media	Audio-based media (audiobooks, voice recordings) Digital files compatible with screen readers Editable text formats (e.g., accessible DOC, PDF)	Learning materials with strong visual elements (images, diagrams, illustrations) Instructional videos with captions or supporting text
Supporting Devices	Screen readers (JAWS, NVDA) Text-to-speech software Braille display (optional)	Clear and concise written text Synchronized captions with videos Gesture support or visual sign displays if available
Information Presentation	Systematic verbal explanations Narrative descriptions for visual content (images, graphs, tables)	Information presented as text and visuals Avoidance of verbal instructions without visual support
Learning Methods	Flexible, narrative-based and structured discussions Individual guidance when necessary	Reliance on visual media and text Active visual approaches such as simulations or observable demonstrations
General Learning Needs	Equal access to all content Independence in learning supported by technology	Learning environment that supports visual communication Adequate lighting and strategic seating to read facial expressions and written text

These findings served as the foundation for the researcher in designing and developing a Universal Design for Learning-based instructional model that accommodates multiple means of representation, engagement, and expression. In response to the identified needs, the researcher developed two primary types of instructional media: (1) an accessible digital module, designed to be compatible with screen reader devices and supplemented with audio narration to support the needs of students with visual impairments; and (2) instructional videos with captions, incorporating rich visual content and supporting text to meet the needs of students with hearing-speech impairments. During the design phase, the researcher began formulating the initial structure of the instructional model grounded in the three core UDL principles: multiple means of representation, multiple means of engagement, and multiple means of expression. This design process was conducted systematically, drawing directly from the findings of the needs analysis phase, particularly addressing the distinct yet complementary learning needs of students with visual and hearing-speech impairments within a single inclusive learning environment. The designed instructional model emphasizes flexibility in content delivery, interaction, and assessment methods, ensuring accessibility and meaningful participation for all students. One of the key strategies adopted was differentiated instruction, whereby learning materials and tasks are provided in multiple formats and approaches, allowing students to select the most suitable mode according to their learning styles and individual conditions. In the development phase, the researcher also mapped out a learning flow that outlines the sequence of inclusive instructional steps from the beginning to the end of

the course. Each session was designed to facilitate active participation from all students through the provision of materials in various formats (verbal, visual, and textual), mixed-group discussions, and assignments that could be completed using multiple modalities. By aligning UDL principles with the assessed learning needs of students, the design phase successfully produced an inclusive and adaptable instructional framework and media plan, ready to be further developed and implemented in subsequent stages.

Table 2. Types of Instructional Media Developed Based on UDL Principles and Their Additional Benefits

Type of Instructional Media	Description	Primary Target Group	Additional Benefits
Accessible Digital Module	Digital format (.doc and accessible .pdf) - Systematic and easy-to-navigate structure - Compatible with screen reader software - Text designed with high readability - Images and graphics include narrative descriptions	Students with visual impairments	Usable by all students for independent study
Captioned Instructional Video	Rich visualization (images, diagrams, animations) - Synchronized closed captions - Easily accessible across various devices - Information conveyed visually to reinforce understanding	Students with hearing-speech impairments	Enhances visual comprehension for all students

The implementation stage represents a critical phase in the initial testing of the instructional model and media developed based on the principles of Universal Design for Learning (UDL). This implementation was carried out in an authentic instructional setting—specifically within a learning cohort of the Special Education Study Program, Faculty of Teacher Training and Education, Universitas Islam Nusantara. The cohort consisted of three groups of students: non-disabled students, students with visual impairments, and students with hearing-speech impairments. The implementation was conducted over six sessions within the "Final Project Supervision" course. During this process, the researcher, acting as the course instructor, integrated the UDL-based instructional model and assistive media into daily teaching practices. Instructional materials were delivered through accessible digital modules and captioned educational videos, while maintaining interactive methods such as group discussions, Q&A sessions, and individualized feedback. Several instructional strategies were employed, including:

1. Multi-format content delivery, encompassing written text, audio narration, and interactive visuals.
2. Flexible assignment submission formats, allowing students to choose between written, oral, or visual presentations.
3. Adapted classroom communication, which involved delivering instructions accompanied by text and visual cues, as well as clear articulation to support students with hearing-speech impairments.

Throughout the implementation, the researcher conducted direct observations of student engagement, recorded emerging challenges, and documented student responses to the instructional media and approaches. Additionally, brief interviews and reflective discussions were conducted with students with disabilities to obtain qualitative feedback on the extent to which the media and model met their learning needs. The initial implementation yielded the following key findings:

1. Students with visual impairments reported greater independence in understanding the course material due to the digital module's compatibility with screen reader software.

2. Students with hearing-speech impairments expressed that the captioned videos significantly enhanced their comprehension of the instructor's explanations and clarified information they had previously missed.
3. Non-disabled students also appreciated the increased flexibility and variety in instructional delivery and learning methods.

These findings provide preliminary evidence that the UDL-based instructional model and media can foster a more inclusive, participatory, and responsive learning environment that accommodates the diverse needs of students. The evaluation stage of this study aimed to assess the effectiveness of the developed and implemented UDL-based instructional model and media. Both formative and summative evaluations were conducted. The formative evaluation took place during the implementation process, utilizing participatory observations, field notes, interviews, and reflective discussions with students—particularly those with disabilities. Findings from this stage indicated that the instructional media and approach were effective in addressing the learning needs of both students with visual and hearing-speech impairments. The digital module was perceived as highly supportive by students with visual impairments due to its screen reader compatibility, while students with hearing-speech impairments highlighted the captioned videos as essential tools for understanding course content. In contrast, the summative evaluation was conducted upon completion of the entire implementation phase. This evaluation employed various methods, including student satisfaction and perception surveys, in-depth interviews to explore learning experiences, and expert validation by instructional media specialists and disability education experts representing the Indonesian Association of Orthopedagogical Educators (APOI). Results from the summative evaluation demonstrated that the UDL-based instructional model was considered effective and appropriate for use in inclusive education contexts. The instructional media were deemed accessible, relevant, and user-friendly for students across a wide range of abilities. However, feedback for future development included the need for more diversified media formats and enhanced peer support systems to optimize the learning experience for students with disabilities. Overall, the evaluation results suggest that the development approach—guided by the ADDIE model—successfully produced instructional models and media that are not only inclusive and responsive to the needs of students with disabilities but also contribute to enhancing the overall quality of instruction for all learners.

Discussion

The findings of this study indicate that the development of instructional models and media based on Universal Design for Learning (UDL) principles successfully accommodated the learning needs of students with disabilities—particularly those with visual and hearing-speech impairments—without diminishing its relevance for non-disabled students (Capp, 2017). The learning model, which was designed responsively based on the results of an initial needs assessment, demonstrated that differentiated and multimodal approaches can foster a more inclusive and participatory learning environment. These findings align with the core principles of UDL, which emphasize the importance of multiple means of representation, engagement, and expression to ensure that all learners are reached (Lintangsari et al., 2023). The accessible digital module developed during this study proved effective in supporting students with visual impairments, primarily due to its compatibility with screen reader software, systematic navigation, and the inclusion of narrative descriptions for visual content. These results corroborate earlier findings by Burgstahler (2015), who highlighted the critical role of accessible digital design in higher education to ensure equitable access. In parallel, the

captioned video materials provided substantial support for students with hearing-speech impairments, as they presented strong visual content accompanied by synchronized textual captions for each audio segment. The presence of captions not only enhanced comprehension of verbal information but also enabled students to engage in learning activities independently. This is consistent with the research of Musti-Rao (2017), who emphasized the importance of adaptive visual media for learners with communication barriers.

Moreover, the successful implementation of the UDL-based instructional model and media in the context of the "Final Project Supervision" course illustrated that students with disabilities do not necessarily require segregated instructional approaches. Instead, universally integrated learning models within regular academic systems offer more sustainable and equitable solutions. This approach addresses the challenge of service fragmentation in education, which often marginalizes students with disabilities in terms of both access to learning materials and participation in academic discourse. This study also reinforces the significance of the UDL principles of multiple means of engagement, representation, and expression, as highlighted in the UDL framework (Suprihatiningrum, 2021). Students with visual impairments, for example, demonstrated increased participation and comprehension when provided with materials accessible via screen readers and accompanied by narrations explaining visual content. This confirms that the modality of information presentation significantly influences both accessibility and the quality of learning experiences (Ahmad, 2015). Conversely, students with hearing-speech impairments reported improved understanding when materials were delivered visually, especially through captioned videos (Ridha & Shehieb, 2021). The application of diverse representations proved to be a foundational element in designing inclusive instruction. The involvement of key stakeholders—such as instructional media experts and disability education specialists from the Indonesian Association of Orthopedagogical Educators (APOI)—further strengthened the quality of the developed model through a validation process grounded in professional expertise and sound pedagogical principles. This underscores the importance of a participatory approach in developing inclusive instructional practices, as Florian and Black-Hawkins (2016) have argued: effective inclusion necessitates collaboration among all stakeholders.

CONCLUSION

This study demonstrates that the implementation of a Universal Design for Learning (UDL)-based instructional model can serve as an effective approach to creating an inclusive and responsive learning system that addresses the diverse needs of university students, particularly those with visual and hearing-speech impairments. The development process, which followed the ADDIE framework, enabled the model and associated learning media to be systematically designed based on real-world needs assessment data. The initial assessment revealed distinct learning needs between students with visual impairments and those with hearing-speech impairments, each requiring media that emphasized auditory and visual modalities, respectively. These differentiated needs were addressed through the development of accessible digital modules and captioned instructional videos, which not only facilitated engagement and comprehension for students with disabilities but also proved beneficial for non-disabled students. The application of UDL principles in the context of higher education in Indonesia—specifically within the Special Education Study Program at the Faculty of Teacher Training and Education, Universitas Islam Nusantara—represents a promising and contextually relevant innovation. This research contributes significantly to the development of inclusive education policy and practice, offering a model that can be replicated across diverse learning environments. Moving forward, continued refinement and broader dissemination of

this model are necessary to ensure the sustainability of equitable and inclusive higher education for all students.

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