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BIDA: BSIT Inclusive Digital Assistant System for Non-Verbal and Hearing-Impaired First Year Learners at SEAIT

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Abstract

This study presented the perception of teachers toward the use of the BIDA System in assisting BSIT first-year non-verbal and hearing-impaired learners at South East Asian Institute of Technology, Inc. (SEAIT). The system aims to improve classroom inclusivity by providing features such as real-time captioning, visual instructions, interactive modules, communication boards, and accessibility settings that address the needs of students with communication barriers. A descriptive research design was used to evaluate the system's usability, functionality, and accessibility. Data were gathered from 50 respondents through surveys. Findings revealed that the System Usability Scale score of 61.5%, indicates it is highly useful in bridging communication gaps. These results suggest that the BI-DA System can significantly aid in enhancing teaching effectiveness and inclusivity for learners with special needs. In conclusion, BIDA provides a hands-on, efficient strategy for inclusion: a compact, modular, accessibility-focused tool that minimizes overhead for teachers while increasing engagement and interaction among students with differing abilities.

Keyword: Non-verbal; Hearing-impaired; Inclusive Digital Assistant System

1. Introduction

1.1. Background and Context

Inclusive education emphasizes providing equal opportunities for all learners, regardless of their abilities. BSIT Inclusive Digital Assistant (BIDA) System have been developed to assist students with learning barriers, including non-verbal and hearing-impaired learners. Such systems integrate real-time captioning, visual content, and communication tools to ensure that students with disabilities can actively participate in class. According to UNESCO (2021), integrating technology in inclusive classrooms not only enhances accessibility but also improves teaching strategies. In SEAIT, first-year BSIT students with communication barriers often struggle to keep up with lectures and peer interactions. This study examines how teachers perceive the usefulness, effectiveness, and challenges of using BIDA in addressing these gaps.

1.2. Research Problem

Although digital tools for inclusive education are available, many teachers face challenges in adapting and fully utilizing these technologies. For non-verbal and hearing-impaired learners, the absence of proper classroom support tools results in limited participation, decreased academic performance, and social isolation. This study investigates the

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perception of BSIT teachers toward using BIDA as a means of enhancing inclusivity and improving teaching effectiveness for these learners.

1.3. Research Questions and Objectives

- How do teachers perceive the usefulness of BIDA System in teaching non-verbal and hearing-impaired learners?
- How do BIDA System features affect teacher-student interaction and classroom inclusivity?
- How do support tools such as real-time captioning, visual modules, and communication boards address the challenges faced by learners with special needs?

Objectives

- To develop BIDA System features that enhance learning opportunities for non-verbal and hearing-impaired students.
- To design Digital Classroom Support System features that enhance teacher–student interaction and classroom inclusivity for non-verbal and hearing-impaired students.
- To implement support tools such as real-time captioning, visual modules, and communication boards to address the challenges faced by learners with special needs.

1.4. Justification and Significance

This research is meaningful because it improves inclusive higher education: in human–computer interaction (HCI) and accessibility-centered design, a BIDA System was developed to improve teacher–student interaction and classroom inclusiveness for BSIT First Year non-verbal and hearing-impaired learners in SEAIT. Contrarily, current classroom technology is primarily based on various adaptations and additions such as real-time captioning, visual modules, and communication boards that do not support genuine instructional workflows or meet teacher's usability requirements. The research relies on teacher's opinions as a background to answer the questions of which BIDA's features are more/less effective, which bring friction, and how the interface and the interaction pattern could be improved to foster equitable participation. The research outcomes will be useful for educators, designers, and administrators by providing: information about evidence-based feature design, raising faculty awareness of digital accessibility practices, and demonstrating institutional policies that sustain inclusive pedagogy. Thus, this study adds a practical evaluation framework and design considerations for user-centered assistive technologies that facilitate accessibility, teaching effectiveness, and learning inclusiveness.

2. Literature review

2.1. Tools and Technique of Assistive Technology for Hearing Impaired People

Education is the most vital part of every human life, which we need to choose our path and advance in it. Through education, we can exchange information by different means - speaking, writing, or using any other way. Impaired hearing or deafness gives rise to difficulties interacting and comprehending what the other person is saying. In this way, assistive technology helps reduce stress among the hearing-impaired people in communication with people without such difficulties. Assistive tools are segmented into three main groups - Assistive Listening Devices (ALD), Augmentative and Alternative Communication (AAC), and Alert systems. In this research paper, we are going to look through some tools and methods, taking into consideration various parameters like alert systems, speech enhancements, SL recognition and learning applications, telecommunication systems, and speech to text. Quite a number of modern devices designed for those with hearing impairments remain at the prototype stage and have not yet been made available for purchase. (Dhanjal, A.S., Singh, W., 2019).

2.2. E-Learning Platform for Hearing Impaired Students

Traditional education changed radically from classroom to online learning. Consequently, e-Learning platforms gained more appeal. But this concept is problematic with some communities of people across the globe. E-Learning platforms are problematic for hearing-impaired people because of their incapacity to hear sound. Thus, through this paper, the authors are providing a learning platform for hearing-impaired communities to assist in learning efficiently. The proposed platform incorporates gestures that promote dialogs among students and tutors with the inclusion of sign language learning materials, questions and answers sessions, and practice activities. The system has a low light enhancement module to improve the videos uploaded by the tutor and a module to convert the uploaded videos to

American Sign Language, and it also converts the questions asked via sign language to text (Siriwardana, S., Vadiveswaran, P., et. al., 2021).

2.3. Educational Methodologies for Hearing Impaired Children Supported by Mobile Technology and Extended Reality: Systematic Analysis of Literature

This research focuses on discovering the Teaching-Learning (TL) methodologies that utilize mobile applications and extended reality for deaf people. The systematic review of mixed-type cross-sectional literature between 2016 and 2020 considers educational mobile applications for deaf children in basic school age, highlighting the type of methodology and support strategies used and the kind of extended reality. development and use technology. The results reveal a lack of documentation of TL applications in children, showing that sign language is the most frequently used communication system. A few applications show the use of collaborative strategies; however, playful ones include memory, cognitive, metacognitive, and affective techniques. Regarding the type of development technology, Android applications supported by multimedia elements are most frequent, followed by the use of Augmented Reality and a minority for other XR technologies (Abasolo, M., Collazos, C., et. al., 2021).

3. Methodology

3.1. Research Design

In order to determine the SEAIT BSIT first-year non-verbal and hearing-impaired learner's teacher's attitudes toward the utilization of BIDA System, a descriptive research design will be used to investigate this issue. In this research, the BIDA System will operate as the independent variable, while the teacher's perception of the technology's suggested attributes acceptability, usefulness, and appropriateness in serving the requirements of learners with communication barriers will be the dependent variable. This design is appropriate for portraying concisely an overview of teacher's perceptions and experiences concerning the role played by BIDA in the process of teaching non-verbal and hearing-impaired students.

3.2. Participants

The participants in this study will be the faculty members of South East Asian Institute of Technology Inc. (SEAIT) who are handling first-year Bachelor of Science in Information Technology (BSIT) classes with non-verbal and hearing-impaired learners. A total of 50 will be involved in the study. This study will focus on gathering their perceptions regarding the use of BIDA System, particularly in terms of accessibility, effectiveness, and applicability in supporting the academic needs of these learners.

3.3. Data Collection

Quantitative data will be gathered through structured questionnaires designed to assess teacher's perceptions of the use of BIDA System for first-year BSIT non-verbal and hearing-impaired learners at SEAIT. Purposive sampling will be used to specifically select faculty members who are directly involved in handling these learners. The data collected will be suitable for statistical analysis, allowing the identification of common perceptions, trends, and patterns regarding the accessibility, effectiveness, and applicability of BIDA in supporting teaching and learning for students with communication barriers.

3.4. Data Analysis

The quantitative data gathered from the structured questionnaires will be analyzed using descriptive statistics. Statistical tools such as means, and standard deviations will be calculated to summarize the teacher's perceptions regarding the use of BIDA System. The analysis will focus on identifying patterns and trends in teacher's views on accessibility, usability, and functionality of BIDA in addressing the learning needs of first-year BSIT non-verbal and hearing-impaired students at SEAIT.

3.5. Ethical Considerations

The study will ensure the protection of participants rights, privacy, and confidentiality. Informed consent will be obtained from all participating teachers before the conduct of the survey, and they will be given the option to withdraw from the study at any time without consequence. Any data gathered will be used solely for research purposes, and no identifying information will be disclosed in the results. The researchers will adhere to ethical guidelines in conducting educational research, making sure that participants will not experience harm, discomfort, or undue pressure during the study.

4. Advanced HCI design

4.1. System Architecture

The BIDA System for BSIT First Year Non-Verbal and Hearing-Impaired learners at SEAIT is designed to promote inclusive education, enhance teacher perception, and support effective communication through assistive technologies and structured digital tools.

Key components include:

- *Client-side (Teacher & Student User Interface):* Provides an accessible platform where teachers deliver lessons and students engage with interactive, inclusive learning materials.
- *Assistive Communication Module:* Offers real-time captioning, sign language integration, and visual prompts to bridge communication gaps.
- *Lesson & Content Management:* Organizes and delivers multimedia lessons and adaptive resources tailored to learner needs.
- *Feedback & Perception Analytics:* Collects teacher feedback and generates insights on system usability and effectiveness.
- *Backend Database:* Stores user data, lesson content, communication logs, and perception survey results securely.

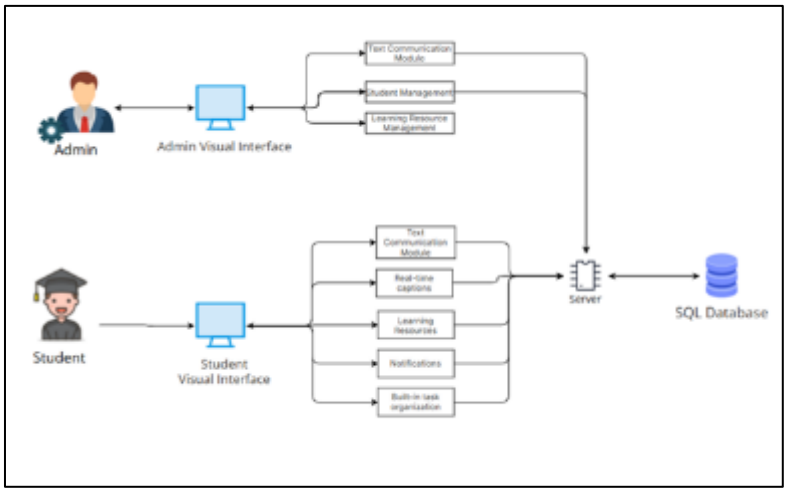


Figure 1 The diagram illustrates the BIDA System, where an Admin Visual Interface links to modules for Text Communication, Student Management, and Learning Resource Management, while a Student Visual Interface connects to Text Communication, Real-time Captions, Learning Resources, Notifications, and Built-in Task Organization; all modules communicate with a central Server backed by an SQL Database for secure, efficient data handling

4.2. Software Engineering Methodology

The BIDA System followed an Incremental Process Model, testable program feature sets in short cycles according to the study objectives. The first increments established core accessibility instruments (including text communication, real-time captioning, visual modules, and communication boards) and administrative functions (management of students and resources). The following increments explored how these components influence teacher–student interaction in class and inclusivity in the classroom, soliciting teacher's perspectives through a test in class, a brief survey, and light analytics to inform iterations. Each iteration's "done" value was a clear criterion: working code integrated with the server and SQL database, passed usability and accessibility checks, and an improved perceived usefulness. This rhythm made it possible to provide feedback, manage risks, and iteratively shape the BIDA toward inclusivity in education by enabling BSIT First-Year non-verbal and hearing-impaired students in SEAIT to learn effectively.

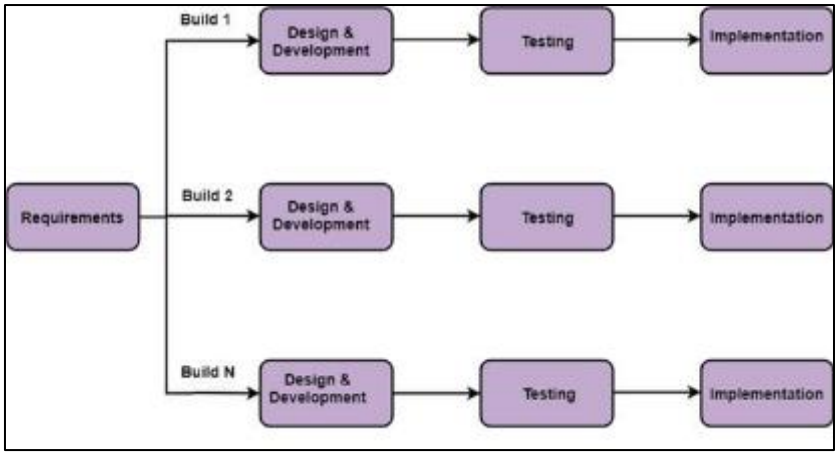


Figure 2 Software Engineering Methodology using Incremental Process Model

4.2.1. Features and Functionalities

The features and functionalities of BSIT Inclusive Digital Assistant (BIDA) System are the following:

4.2.2. Text-to-Speech Communication

This feature converts written text into spoken words, enabling teachers to deliver lessons audibly and making content more accessible for non-verbal learners.

4.2.3. Real-time Captioning of Lessons

The system provides instant captions during lectures, ensuring hearing-impaired learners can follow discussions and instructions without delay.

4.2.4. Downloadable Learning Resources for Offline Accessibility

Teachers and students can download lesson materials, presentations, and references, allowing continuous learning even without internet access.

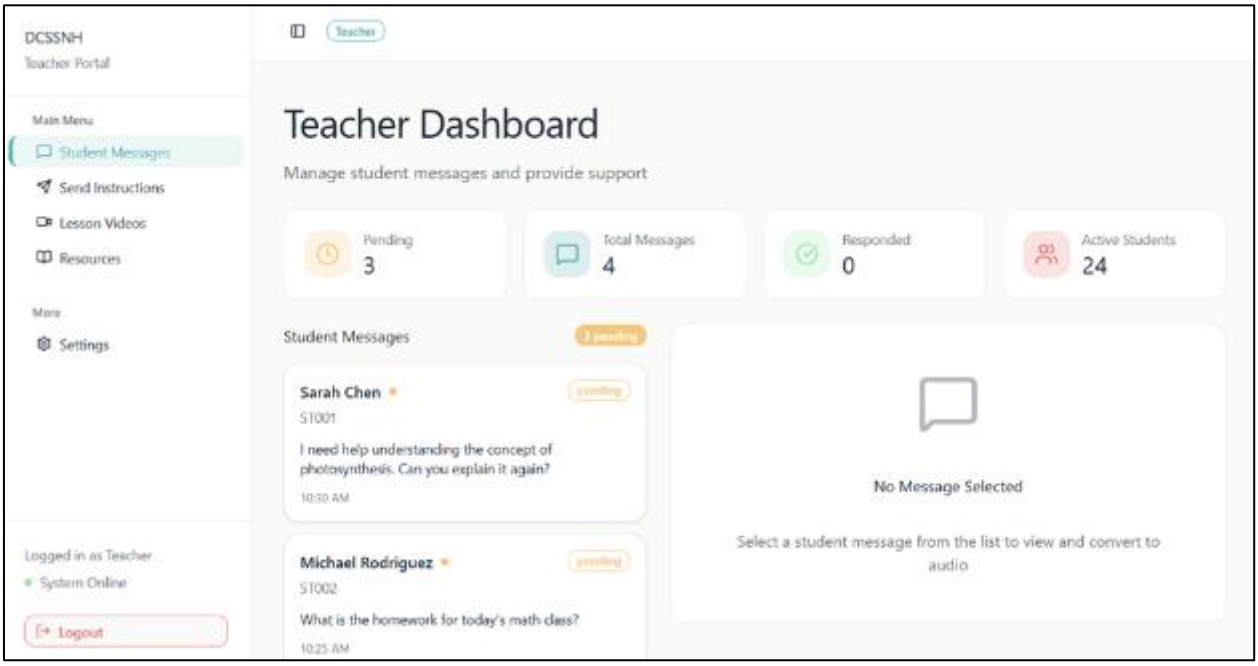
4.2.5. Notifications

The system sends timely alerts and reminders about class schedules, assignments, and updates, helping both teachers and students stay informed.

4.2.6. Built-in To-do List for Task Organization

This feature allows teachers and learners to organize tasks, track deadlines, and manage academic responsibilities more efficiently.

4.3. User Interface Design



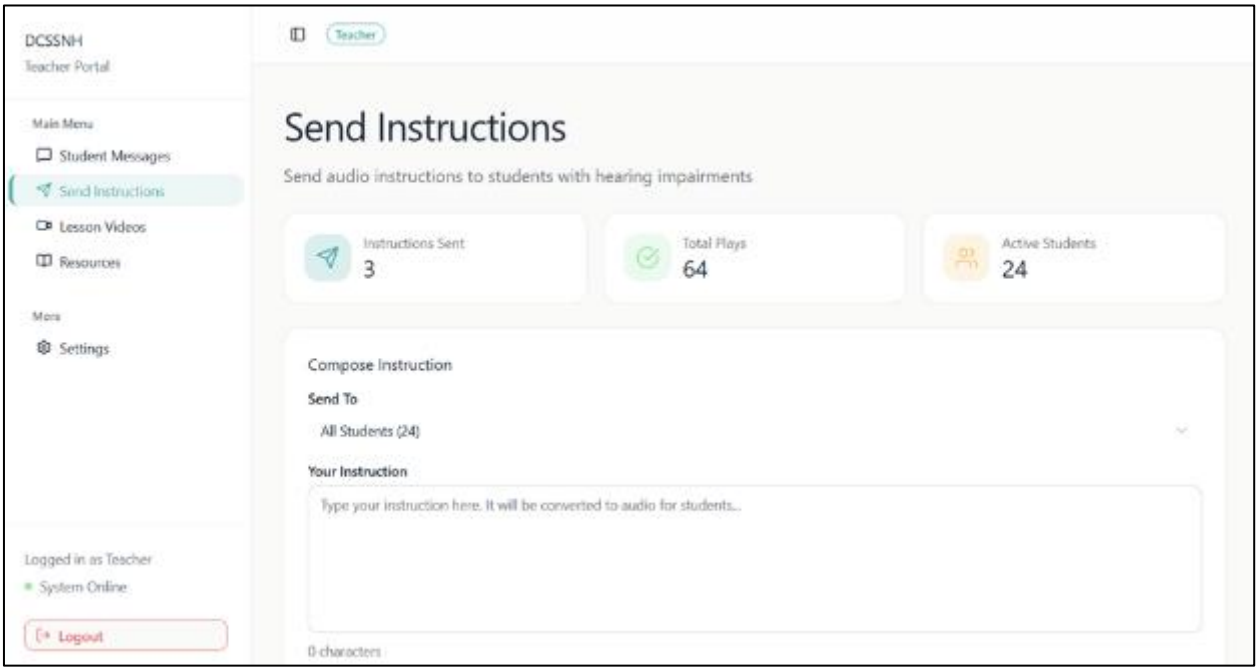


Figure 3 The admin page of the BIDA System

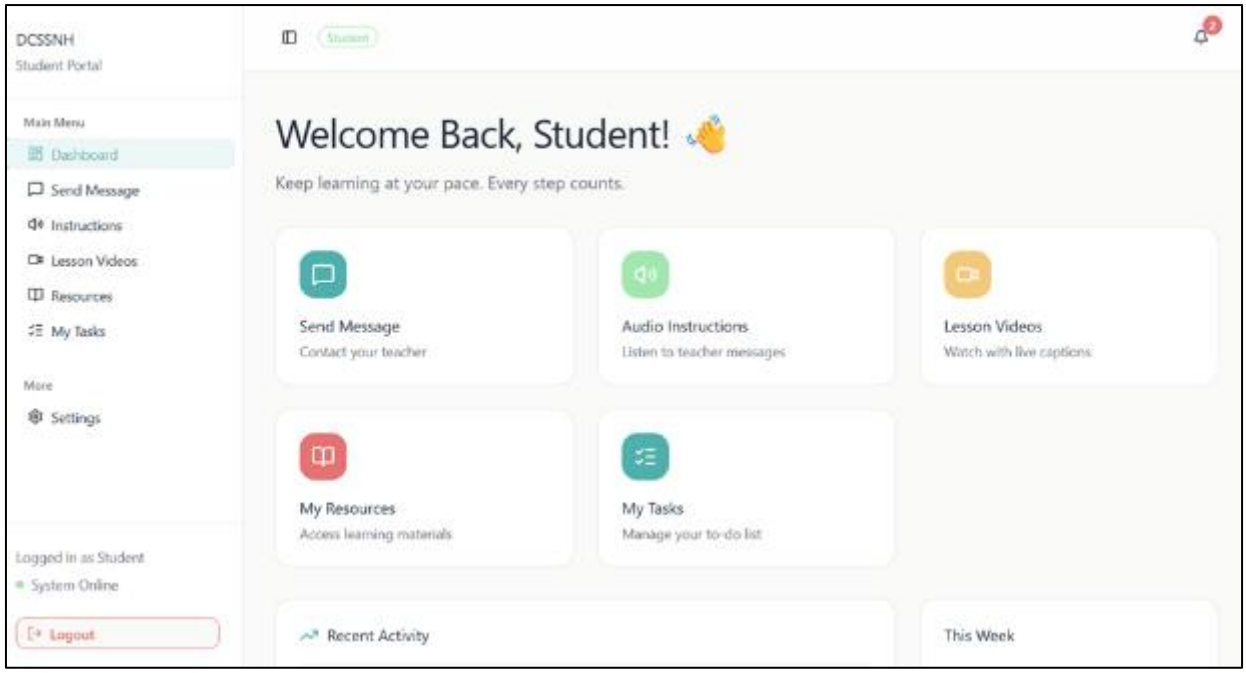
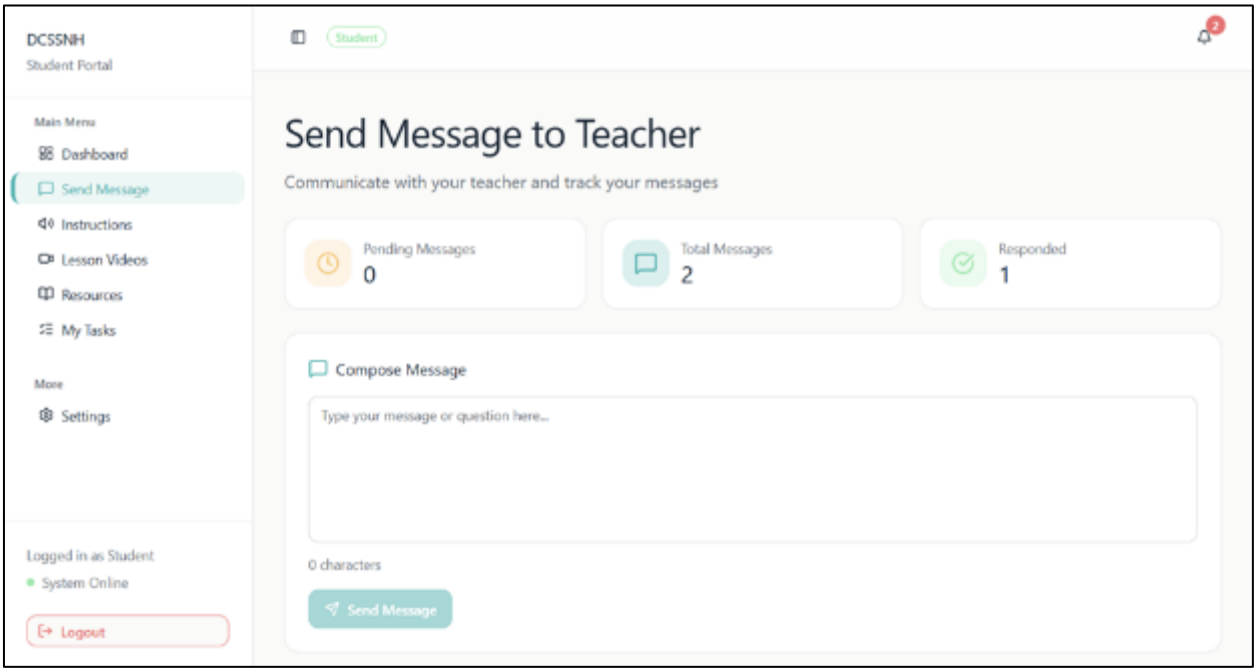


Figure 4 The student's dashboard page of the BIDA System



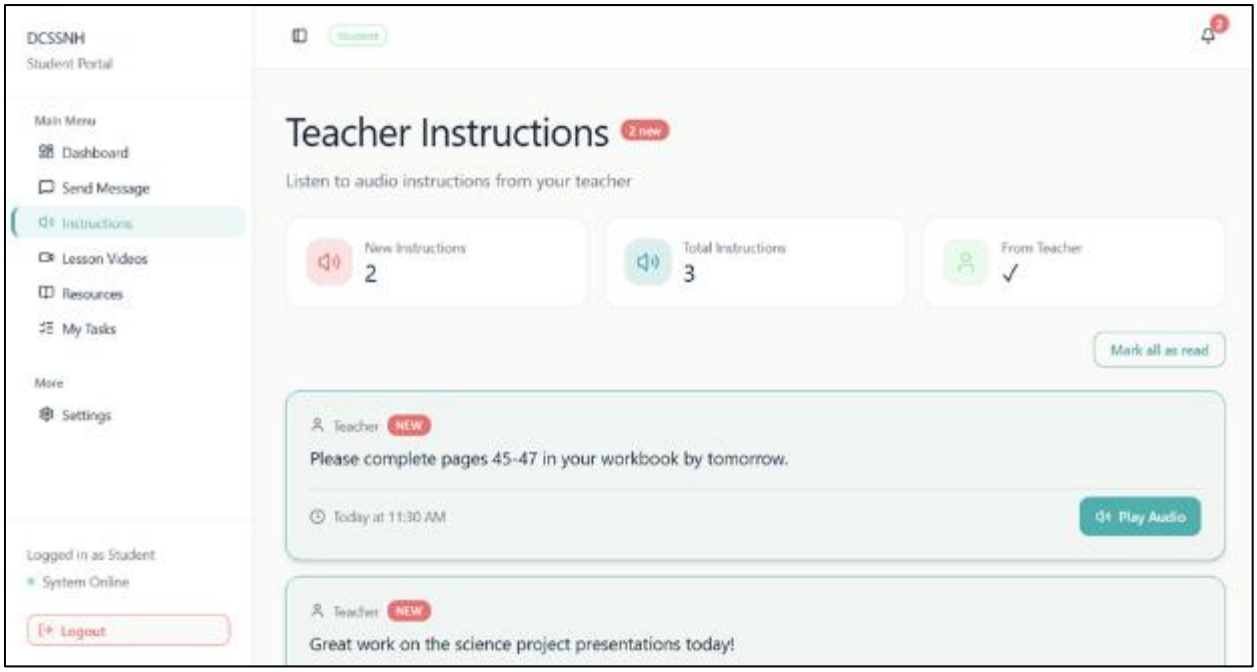


Figure 5 The Text-to-Speech page of the BIDA System

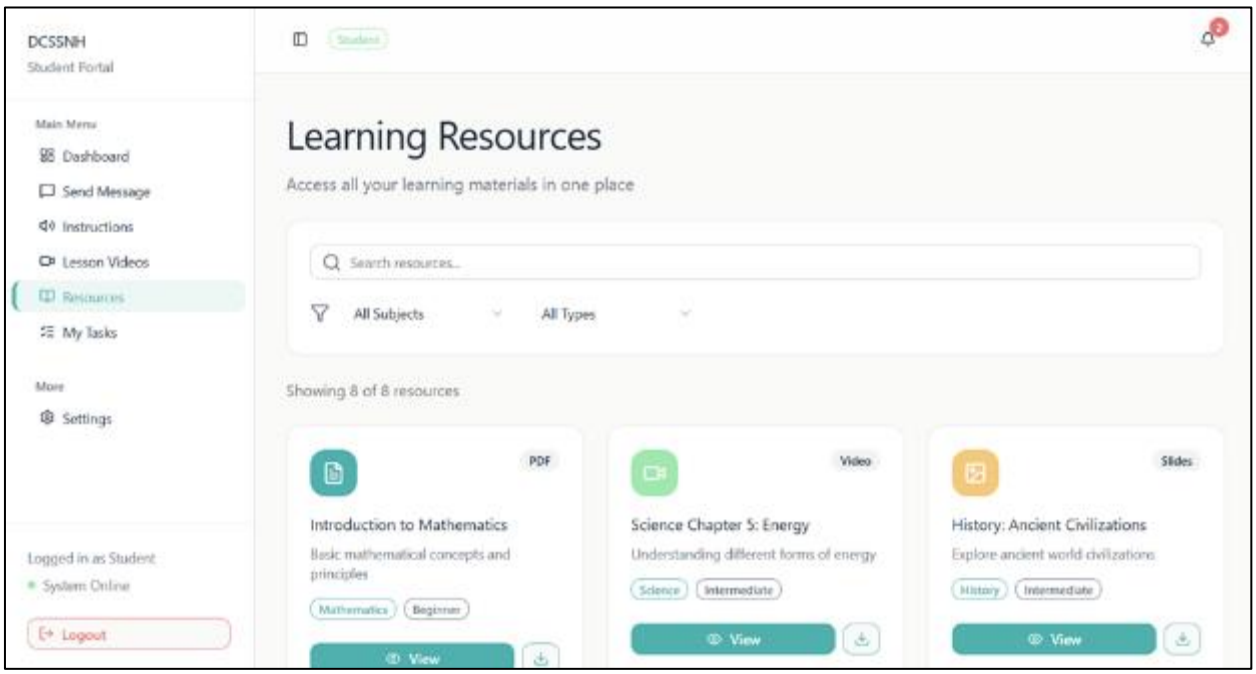


Figure 6 The Learning resources page of the BIDA System

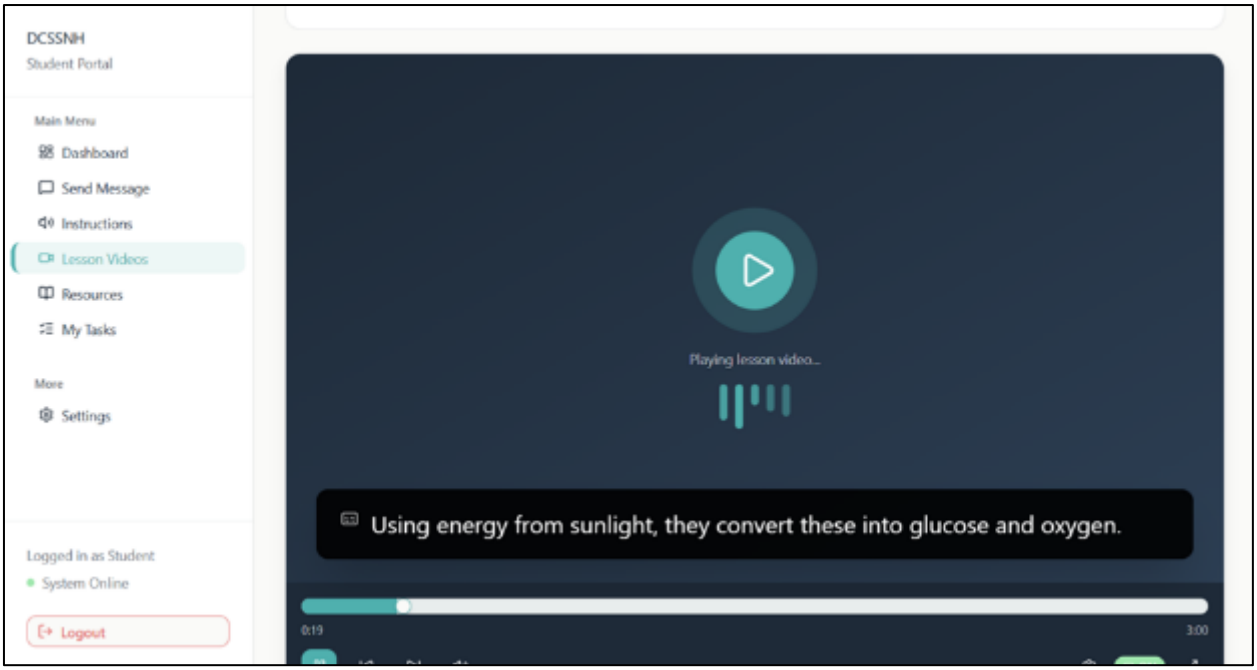


Figure 7 The Real-time captioning page of the BIDA System

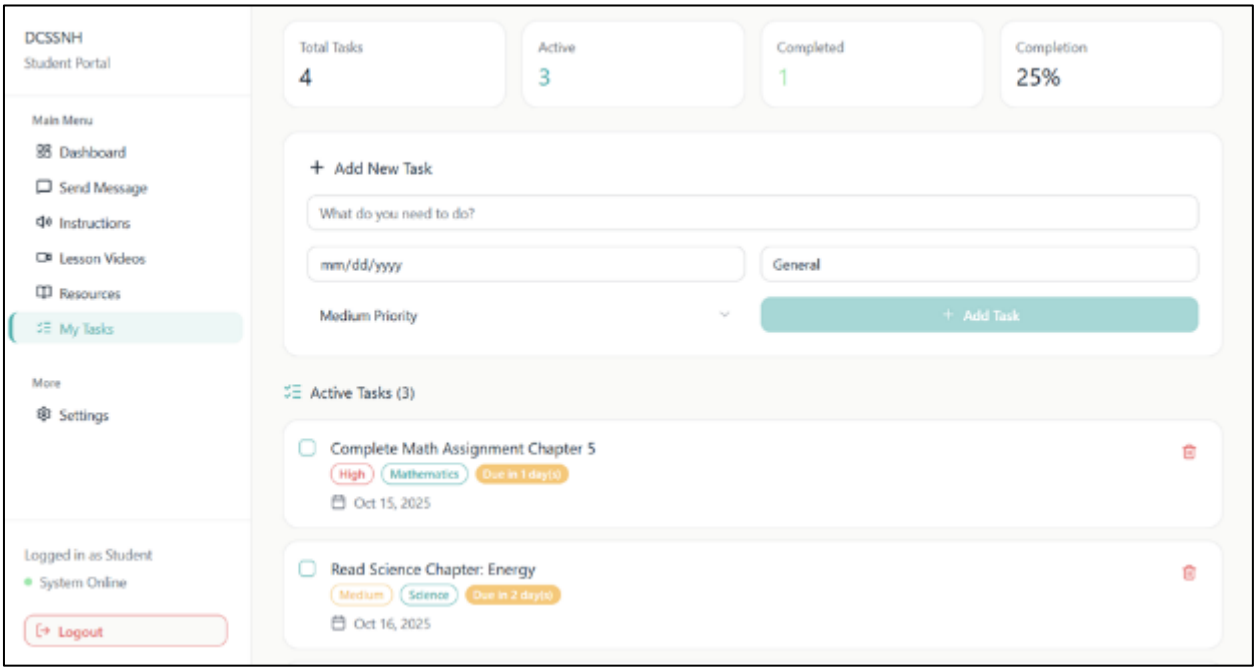


Figure 8 The Built-In Tasks Organization page of the BIDA System

5. Evaluation and results

5.1. Usability Testing

The perception of the BIDA system was positive for its usability attribute. The items measuring user's confidence in using BIDA (Mean: 3.11 = 77.75%) and ease of use (Mean: 3.02 = 75.5%) scored high. Usefulness measured the intention to use the system frequently (Mean: 3.04 = 76%), integration of features (Mean: 2.98 = 74.5%), and learning the system (Mean: 2.93 = 73.25%) were also perceived as positive by the users. The total mean of 2.46 or 61.5& reflects a positive perception of the attribute.

Table 1 Usability Result Table

Questions	Mean
I think that I would like to use BIDA frequently.	3.04
I found BIDA unnecessarily complex.	1.86
I thought BIDA was easy to use.	3.02
I think I would need the support of a technical person to use BIDA.	1.95
I found the various functions in BIDA (e.g., captions, text-to-speech, resources, to-dos, notifications) were well integrated.	2.98
I thought there was too much inconsistency in BIDA.	1.96
I would imagine that most people would learn to use BIDA very quickly.	2.93
I found BIDA very cumbersome to use.	1.73
I felt very confident using BIDA.	3.11
I needed to learn a lot of things before I could get going with BIDA.	1.99
TOTAL MEAN	2.46

5.2. Performance Metrics

The system accessibility and user experience were evaluated based on the performance indicators related to accessibility and ease of use as perceived by the teachers. Accessibility and usability are assessed overall with the results.

Accessibility: 2.96 – Survey results show that the system was easy to access and use—the options notifications & to-dos (3.08), screen-reader compatibility (3.04), live subtitles or real-time captions (3.03), overall accessibility support (3.01), and offline or downloadable resources (2.98) were rated positively with language clarity (2.94), keyboard navigation (2.90), text-to-speech (2.90), text/contrast adjustment (2.89), and accessibility settings (2.85). The user liked the design and working; thus, the overall system may be improved in more detail with the continuous consideration of accessibility and user experience.

Table 2 Accessibility Result Table

Questions	Mean
The real-time captions were accurate and synchronized with the lesson content.	3.03
The text-to-speech output was clear and understandable.	2.90
I could adjust text size and contrast to a comfortable level.	2.89
I was able to navigate BIDA using keyboard-only input (e.g., tab order, focus indicators).	2.90
Screen readers (or reading tools) could correctly read interface elements and learning materials.	3.04
Downloadable learning resources were accessible offline and remained readable (captions/alt text preserved).	2.98
Notifications and to-do lists were clear, distinguishable, and easy to manage.	3.08
The language used in the interface (labels, instructions, errors) was simple and easy to understand.	2.94
The accessibility settings (captions, voice, font, contrast) were easy to find and customize.	2.85
BIDA supported my accessibility needs during teaching/learning activities.	3.01
TOTAL MEAN	2.96

Functionality: 3.01 – The results of the review of BIDA indicate generally strong performance in the implemented features. The score for the interconnection of the primary modules—captions, TTS, resources, notifications, and to-dos—was the highest at 3.16, suggesting that the data is smoothly exchanged from one tool to another. The to-do list feature performed well (3.08), and users rated the quality of error messages (3.07) as high, contributing to very strong functional behavior (3.06) and system stability (3.04) in the demands of classroom work. In the day-to-day operations, relevant and timely notifications (2.99), offline and accessible resources (2.98), and common-sense real-time captions (2.97) were all available, while TTS (2.86) and responsiveness (2.89) were slightly lacking. Overall, the evaluation score shows that the implemented features of BIDA function as expected and are fit for classroom use.

Table 3 Functionality Result Table

Questions	**Mean**
The real-time captions functioned correctly and were synchronized with the lesson.	2.97
The text-to-speech feature produced clear audio and operated without errors.	2.86
Downloadable learning resources opened and worked offline as expected.	2.98
Notifications arrived on time and reflected the correct class updates and deadlines.	2.99
The built-in to-do list saved, updated, and marked tasks reliably.	3.08
All major BIDA modules (captions, TTS, resources, notifications, to-dos) were well-integrated and shared data consistently.	3.16
The system responded quickly to inputs and page actions.	2.89
BIDA remained stable during use (no crashes, freezes, or data loss).	3.04
Error messages (if any) were informative and allowed me to continue the task.	3.07
Overall, the functional behavior of BIDA met my expectations for classroom use.	3.06
TOTAL MEAN	3.01

5.3. Comparative Analysis

In this research, the BIDA platform was compared with study-management and LMS-based tools that are commonly used in inclusive classrooms. According to teacher reviews, BIDA was relatively more user-friendly and tailored to developing and implementing classroom support. Its features—real-time captions, text-to-speech, downloadable, as well as to-dos and notifications—required minimal time to learn before application. While most alternatives saddle users with unnecessary distractions by separating functions into different tabs or pages that require additional steps, BIDA offered applications in a more parallel fashion, ensuring that instruction can be made in a more suitable order with less resistance towards general classroom management. From the respondents' side, minor tweaks were recommended (e.g., first-time users were taken into consideration for loading performance, features like text-to-speech could be refined, etc.). Consequently, BIDA proved to be a more flexible and efficient alternative than other tools for aiding such learners.

5.4. Results and Findings

The total means across all areas indicate that the BIDA System met its objectives:

- Usability – 2.46
- Accessibility – 2.96
- Functionality – 3.01

According to the analysis of the System Usability Scale (SUS), BIDA performed well in terms of functionality and accessibility, and usability was generally perceived as positive. The surveyed teachers confirmed that they were satisfied with the system and found it both practical and easy-to-operate, consequently assisting in sustaining concentration, enhancing interaction in class, as well as facilitating further engagement of non-verbal learners and those with hearing impediments.

6. Discussion

6.1. Interpretation of Findings

BIDA's accessible interface and unified classroom features, especially real-time captions, speech text, downloadable materials, and organized order and alerts, helped boost instructional delivery and engagement between the teacher and the nonverbal and hearing-impaired learners. Teacher assistance likely occurred unhindered since the obstruction of functionality (3.01) and accessibility (2.96) occurred rarely. According to usability findings, the interface is simple to master and operate within. When deployed, BIDA technical screening demonstrated that the mix of precise captions, clear guidance, and well-crafted module integration provided the platform with robust communication capabilities, shorter setup times, and greater learner engagement. Some elements, like refining real-time responsiveness and improving speech and caption controls for novices, necessitate constant critical review. Nevertheless, interface controls and feature integration contributed positively to establishing a more accessible, effective, and sustained learning environment.

Table 4 Descriptive Survey Result Table

Questions	Mean	Standard Deviation
To what level do BIDA tools (e.g., real-time captioning, text-to-speech, visual modules) support your instruction of non-verbal and hearing-impaired learners?	3.11	0.85
How often does the BIDA System improve teacher–student interaction during class?	3.06	0.79
How would you rate the user-interface design of BIDA for classroom use (e.g., layout, icons, clarity)?	3.00	0.93
How much do you agree that BIDA enhances classroom inclusivity and participation for learners with communication needs?	3.06	0.79
How satisfied are you with the effectiveness of BIDA's support tools (real-time captioning, visual modules, communication boards) in addressing learners' challenges?	2.94	0.82
TOTAL MEAN	3.03	0.83

RQ1: *How do teachers perceive the usefulness of BIDA System in teaching non-verbal and hearing-impaired learners?*

Based on the evaluation results, teachers considered BIDA useful for instruction, with the mean score for the evaluation results at 3.11. Through the faculty rating, the tools, real-time captioning, text-to-speech, and visual modules, were found to aid with lesson delivery and break down communication barriers, as evidenced by the averaging of the full descriptive set at 3.03, thereby reinforcing BIDA's potential classroom uses in the favor of teachers. The BIDA interface was also evaluated positively for its classroom use (M=3.00), indicating relatively minimal friction when users encounter the system.

RQ2: *How do BIDA System features affect teacher-student interaction and classroom inclusivity?*

Results show that BIDA enhanced teacher–student interaction with Mean = 3.06 and improved classroom inclusivity and participation with Mean = 3.06, for learners with communication needs. These parallel ratings indicate that the integrated feature set captions, and visual supports helped maintain dialogue during lessons and extend participation opportunities. The results are consistent with the overall Total Mean = 3.03, where it is positive across items.

RQ3: *How do support tools such as real-time captioning, visual modules, and communication boards address the challenges faced by learners with special needs?*

Teachers said that the support mechanisms employed by BIDA successfully deal with the difficulties students encounter, and they are satisfied (Mean = 2.94) and consider that they are adequately instructed (Mean = 3.11). Overall, the scores indicate that real-time captions, visual modules, and communication boards were effective tools in minimizing confusion, improving clarity, and offering additional avenues for participation essential factors in accommodating the needs of students who are non-verbal or hearing-impaired.

6.2. Contributions and Innovation

This study shows that the BIDA System is a suitable classroom tool to accommodate the needs of students with hearing impairments and other non-verbal learners while maintaining accessibility and flow of the lesson. Instead of adding various features to the platform, BIDA focuses on captions in real time, clear text-to-speech, visual modules, resources that can be downloaded, and defined to-dos/notifications that are all part of the one package that allows students to have the right content and lets teachers focus on their teaching. Keeping accessibility in mind as well as the ease of use minimizes the cognitive load on both teachers and students who do not waste time finding the interaction controls or needlessly translating information between tools. Designing future educational tools in this manner, BIDA proves that simplicity and integration with a concept of inclusivity are more powerful than complexity and provide a good model for classroom technology that is scalable and accessible.

6.3. Limitations and Future Work

This study was limited to a small group of SEAIT teachers working with non-verbal and hearing-impaired learners. Another limitation was the mix of devices used during testing; several participants operated BIDA on outdated or low-end laptops, PCs, tablets, or smartphones—often on unstable networks—which likely affected responsiveness and real-time features such as captioning and text-to-speech. Future work should involve a larger, more diverse cohort and standardized device/network conditions to better assess performance across classrooms.

7. Conclusion

7.1. Summary of Key Findings

The research showed that the BIDA System was effective in supporting teaching to non-verbal and hearing-impaired learners in the SEAIT environment by enhancing communication and inclusivity in the classroom. Teachers described their experience with BIDA's real-time captioning, text-to-speech, visual modules, to-dos/notifications, and downloadable resources as useful for daily instruction and measured the effects as positive across Functionality (3.01) and Accessibility (2.96) as well as generally positive regarding Usability (2.46). The descriptive findings demonstrated that BIDA contributed to instruction (3.11), enhanced the levels of teacher–student interaction and inclusivity (3.06, respectively), and supplied a classroom-ready interface (3.00). Overall, these effects suggest that BIDA workflows that are transparent and integrated allow teachers to better monitor instruction and deliver options for levels of access to learners with communication requirements.

7.2. Final Remarks

In conclusion, BIDA provides a hands-on, efficient strategy of inclusion for the classroom, a compact, modular, accessibility-focused product, where tool management isn't sabotaging the teaching and learning processes. Without excess details, the BIDA's distinguishing traits increase involvement and interaction for students with differing abilities. The continuous updating with more wide-ranging teacher contributions can positively expand interactivity and encompass studies sections, strengthening BIDA as a tool for mastery instruction in a clear manner for all.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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Apendices

- Appendix A: System Usability Scale (SUS) Likert Scale Survey Questionnaire

Functionality

Questions	**Ratings**			
The point and reward features worked as expected.	1	2	3	4
It is not difficult to understand how the system works.	1	2	3	4
The system responded quickly to my inputs.	1	2	3	4
I feel dissatisfied with the functionality of the system.	1	2	3	4
The ranking system made me want to participate more.	1	2	3	4
I find the system performance to be slow or unreliable.	1	2	3	4
All major features of the system worked as I expected.	1	2	3	4
It is not difficult to understand how the system's function works.	1	2	3	4
I found the various functions in this tool were well integrated.	1	2	3	4
I encounter obstacles or complications while attempting to redeem rewards through the system.	1	2	3	4

Accuracy

Questions	**Ratings**			
I thought the system was easy to use.	1	2	3	4
I found the system unnecessarily complex.	1	2	3	4
I needed to learn a lot of things before I could get going with this system.	1	2	3	4
I would imagine that most people would learn to use this system very quickly.	1	2	3	4
I think that I would need the support of a technical person to be able to use this system.	1	2	3	4
I found the tool very cumbersome to use.	1	2	3	4
I felt very confident using the tool.	1	2	3	4
I thought there was too much inconsistency in this tool.	1	2	3	4
I think I would like to use this tool frequently.	1	2	3	4
I found the overall experience of using the system enjoyable.	1	2	3	4

Accessibility

Questions	**Ratings**			
The system's visual elements (e.g., icons, buttons, and labels) were clear and easy to identify.	1	2	3	4
The quizzes were easy to read and understand, even when accessed on different devices.	1	2	3	4
The reward claiming process (e.g., internet access credits) was simple and straightforward.	1	2	3	4
I found it easy to locate instructions or help when using the QuizFi system.	1	2	3	4
The system allowed me to access quizzes without unnecessary delays or errors.	1	2	3	4
I had difficulty navigating to specific features like checking rewards or claiming internet time.	1	2	3	4
I was confused about how to use certain parts of the system without guidance.	1	2	3	4
The system responded slowly or lagged while I was taking a quiz or accessing my rewards.	1	2	3	4
The internet reward was not immediately accessible after completing a quiz.	1	2	3	4
I found the system difficult to use when I was in a hurry or under time pressure (e.g., during class breaks).	1	2	3	4

- Appendix B: Descriptive Survey Questionnaire

BIDA: BSIT Inclusive Digital Assistant System for Non-Verbal and Hearing-Impaired First Year Learners at SEAIT

1. To what level do BIDA tools (e.g., real-time captioning, text-to-speech, visual modules) support your instruction of non-verbal and hearing-impaired learners?

☐ Not At All ☐ Slightly ☐ Very Much ☐ Extremely

2. How often does the BIDA System improve teacher–student interaction during class?

☐ Never ☐ Rarely ☐ Often ☐ Always

3. How would you rate the user-interface design of BIDA for classroom use (e.g., layout, icons, clarity)?

☐ Very Poor ☐ Poor ☐ Good ☐ Excellent

4. How much do you agree that BIDA enhances classroom inclusivity and participation for learners with communication needs?

☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

5. How satisfied are you with the effectiveness of BIDA's support tools (real-time captioning, visual modules, communication boards) in addressing learners' challenges?

☐ Very Dissatisfied ☐ Dissatisfied ☐ Satisfied ☐ Very Satisfied