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LISTEN TO ME: TRANSFORMING LEARNING ACCESSIBILITY WITH AN AUDIO-BASED ANDROID APP FOR VISUALLY IMPAIRED CHILDREN

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Abstract

This research aims to design and develop an audio-based Android application, Listen to Me app, specifically designed to support the learning needs of visually impaired children. The application seeks to enhance accessibility to educational content by providing audio-based materials, enabling users to engage with learning resources independently. The study adopts a Research and Development (RnD) approach, utilizing the Waterfall Method development model. This structured approach consists of four main stages: conducting a user needs analysis, designing the application, developing a prototype based on inclusive design principles, and testing the usability of the application with visually impaired children. Each stage is meticulously aligned with the goal of creating a user-friendly and effective learning tool. The findings reveal that the app significantly improves learning accessibility through its interactive features, such as voice-guided navigation and customizable audio content tailored to user preferences. These results highlight the potential of Listen to Me app to empower visually impaired children by fostering their independence in accessing and engaging with educational content. The primary contribution of this research is the development of an innovative and inclusive audio-based learning platform. It provides a technological solution that addresses the unique learning challenges faced by visually impaired children, offering them greater autonomy and opportunities in education.

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INTRODUCTION

In today's increasingly digital educational landscape, visually impaired children continue to encounter significant barriers due to the overwhelming dominance of visually oriented platforms. While educational technology has dramatically improved access to information for many learners, these advances have not been equally inclusive. As Xu and Zhu (2023) and Yan and Li (2023) point out, most platforms remain inaccessible to visually impaired learners because they are primarily designed for visual interaction, marginalizing students who rely on alternative sensory inputs. This inequality undermines the principles of inclusive education and restricts visually impaired children's ability to fully participate in learning environments. Addressing this gap requires innovative solutions that shift the focus from visual to auditory-based modalities. One promising response is the development of audio-based technologies, which allow users to engage with educational content through listening rather than sight. A

prominent example of such innovation is the *Listen to Me* app—an Android-based application developed specifically to promote independent learning among visually impaired children.

The effectiveness of audio-based learning media for visually impaired learners has been documented in various studies. Saputra et al. (2022), through their research at SLB-A YAPTI Makassar, found that audio-based tools significantly enhanced both the accessibility and quality of learning for visually impaired children, allowing them to obtain information independently. Similarly, Mardiyah and Marlina (2024) developed the *Braille Button* application, which utilizes audio technology to help blind students better understand learning materials. Lestari and Rozi (2020.) further observed that the use of auditory media takes full advantage of visually impaired children's heightened auditory sensitivity, enabling them to grasp educational content more effectively. Research by Abdullayeva et al. (2023) also demonstrated that inclusive teaching approaches—particularly audio-lingual and communicative strategies—are well-suited for engaging visually impaired students in English language learning. Complementing this, Umifa et al. (2022) found that mobile apps incorporating audio features improve listening skills and provide ease of use, making them ideal for visually impaired users. V.S. Kadam (2024) highlighted the broader impact of voice-based applications, emphasizing their potential to increase user independence and self-sufficiency. These collective findings strongly support the integration of audio technology in educational settings for the blind.

Moreover, Farah et al. (2024) emphasized the significant role of audio-visual technology in improving language learning outcomes for visually impaired students, boosting not only comprehension but also self-confidence, communication skills, and independence. However, despite this progress, a gap remains in the availability of applications specifically designed to promote autonomous learning for visually impaired children. Nadia (2015) argued that digital technologies should inherently support greater accessibility for people with disabilities. Unfortunately, in practice, many platforms fail to meet this ideal, maintaining significant usability barriers. Therefore, this research focuses on developing the *Listen to Me* app as a breakthrough that comprehensively supports learning independence through inclusive audio-based solutions.

The *Listen to Me* app presents a new approach to educational accessibility for visually impaired children by addressing limitations in existing tools. While numerous audio-based learning applications are available, many still depend on adult guidance, which can hinder the development of learner autonomy. *Listen to Me* distinguishes itself by offering a self-directed learning experience via a user-friendly Android interface, designed explicitly for independent use by visually impaired children. Its core features include intuitive voice-based navigation that guides users through the interface, customizable educational content aligned with individual learning needs, and a responsive feedback system that allows learners to interact meaningfully with the material. Unlike many current applications, this tool adheres to inclusive design principles, ensuring that children with visual impairments can use it without additional support. The app serves not only as a content delivery platform but also as a tool to foster essential 21st-century skills such as self-regulation, digital literacy, and confidence in navigating learning resources. The app's development follows a user-centered design framework, starting with an analysis of learners' needs and experiences, proceeding to prototype development based on feedback from visually impaired children and educators, and culminating in user testing to evaluate its effectiveness. Through this process, the app is expected to contribute to both academic performance and the broader goal of inclusive education. In doing so, it expands the literature on accessible learning technologies and offers practical solutions for implementing audio-based media in special education.

The urgency of developing such inclusive technologies is underscored by continued research on the needs of visually impaired learners. Hanif et al. (2023) emphasized that visually impaired children benefit most from multisensory educational approaches, which combine

audio with other sensory inputs to build a richer understanding of learning materials. Meanwhile, Rahman et al. (2024) acknowledged the promise of assistive audio devices but noted the shortfall in applications designed specifically for educational contexts. Many digital tools today prioritize visual engagement, often neglecting essential accessibility features such as audio navigation or screen reader compatibility (Taufiqurrahman et al., 2022). Hikmah et al. (2024) reinforce the call for inclusive design that actively supports equal access and fosters learner independence.

Audio technology, when thoughtfully integrated, meets these needs effectively. Villalba et al. (2024) showed that audio platforms enhance inclusivity and efficiency in delivering educational content to blind learners. Llorca et al. (2023) found that text-to-speech technology significantly improves comprehension, while Karimi et al. (2024) observed that speech recognition and voice interaction enable learners to navigate applications independently. These capabilities help build essential skills such as communication, problem-solving, and self-direction—outcomes central to any educational experience. Through a combination of these technologies, the *Listen to Me* app offers not only academic content but also scaffolds for confidence-building and social development.

The body of evidence supporting the benefits of audio-based technologies is vast. Manu and Masan (2020) reported a 74.3% improvement in reading comprehension among visually impaired students using text-to-speech tools in English education. Siahaan et al. (2020) affirmed that voice recognition fosters user autonomy, allowing blind individuals to control devices and access content more freely. Ganesan et al. (2022) similarly concluded that text-to-speech applications support content understanding, while Hidayat (2020) found that voice-based applications improve learning independence. Andriani et al. (2024) suggested that voice recordings can enhance language learning outcomes. Interactivity is a key aspect of these technologies, as evidenced by Yudhistiro and Silalahi (2021), who found improvements in pronunciation and vocabulary through audio tools. Putri (2020) also emphasized that voice-based apps positively affect student motivation and comprehension. Tjahyanti et al. (2024) linked interactive learning environments with better problem-solving skills in children with disabilities. Despite these advancements, Hakobyan and Grigoryan (2024) noted that many applications still fall short in addressing the specific needs of visually impaired users. Such shortcomings emphasize the relevance of *Listen to Me*, which merges interactive audio features with accessibility considerations to create a more inclusive educational experience. By integrating insights from this extensive body of research, the app's development not only contributes to improved educational accessibility but also empowers visually impaired children to become more confident, independent learners in the digital age.

RESEARCH METHOD

Research Design

This study employs a Research and Development (R&D) methodology, a systematic and iterative approach ideally suited for the creation of educational products such as the *Listen to Me* application. This method involves a structured sequence of steps—needs analysis, product design, development, testing, and evaluation—allowing researchers to refine the application based on continuous feedback. The R&D approach is particularly appropriate for this study because it emphasizes user-centered design, ensuring that the final product is practical, functional, and relevant to the specific context of visually impaired children. The primary site for implementation and testing is Sekolah Luar Biasa (SLB) Pringsewu, where the application is tested directly with visually impaired students, allowing the research team to observe real-time interaction, usability, and learning outcomes. Through this process, researchers can obtain in-depth insights into the children's responses to the app's features, including voice navigation, audio content, and ease of access. This iterative feedback loop is essential in identifying necessary adjustments and enhancements to improve the application's

accessibility and learning effectiveness. Moreover, involving actual users throughout the testing phase not only validates the product's educational impact but also ensures inclusivity and relevance. The R&D approach thus serves as both a framework for innovation and a tool for quality assurance, guaranteeing that *Listen to Me* evolves into a well-designed educational solution that empowers visually impaired children to learn independently and confidently in a digital learning environment.

Research Stages

The research for the development of the *Listen to Me* application follows four main stages: analysis, design, coding/development, and testing. In the analysis stage, the researchers identified the needs and challenges faced by visually impaired children in audio-based learning, gathering insights from teachers and education experts. During the design stage, the team created a user-friendly interface and planned audio features specifically tailored for blind children, such as text-to-speech technology and voice recognition. The coding/development stage focused on implementing the application technically using the Android platform, incorporating the features designed earlier. Finally, in the testing stage, the application was evaluated by blind children at Sekolah Luar Biasa (SLB) Pringsewu to assess its performance, usability, and responsiveness to user needs. The results of these tests were then analysed to identify areas for improvement and refinement before the application was further implemented.

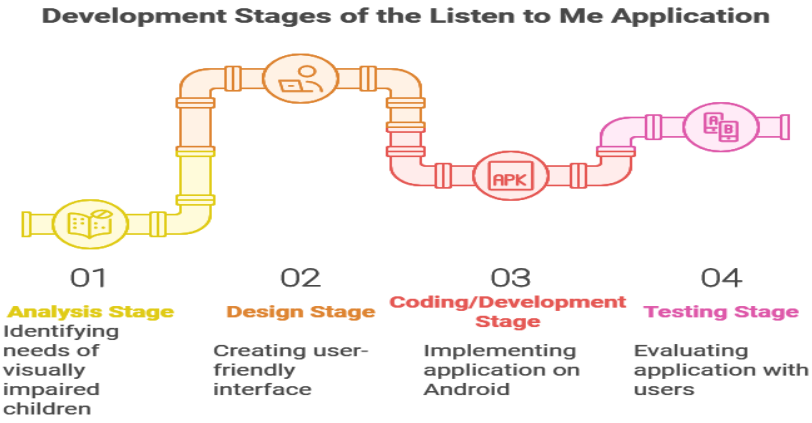

Figure 1. Development Stages

Data Analysis

The data analysis phase of this research employed a combination of interviews and observational methods to obtain a comprehensive understanding of the educational needs of blind children. Interviews were conducted with teachers and educators at SLB Pringsewu to explore their firsthand experiences in teaching visually impaired students. Through these discussions, researchers gathered detailed information regarding the students' learning challenges, current limitations of available teaching tools, and the educators' expectations for an audio-based learning application. These insights were instrumental in identifying specific preferences and essential features that the app should include, such as intuitive navigation, clear audio instructions, and adaptive learning content tailored to individual needs. In addition to interviews, researchers conducted structured observations by closely examining how blind students interacted with technology and assistive learning tools in real classroom settings. These observations provided direct insights into students' behavioral patterns, navigation difficulties, and reliance on audio cues. Observing these interactions allowed researchers to understand the

practical usability concerns that might arise when blind children engage with educational technology. The combined data from interviews and observations were systematically analyzed to identify core themes, which then informed the design of the Listen to Me application.

RESEARCH FINDINGS AND DISCUSSION

Research Findings

Analysis Stage

The user needs analysis for this audio-based application was conducted by collecting information from two primary sources: experienced teachers who work with blind children and education experts specializing in inclusive education. Interviews with teachers revealed that visually impaired children often face challenges in accessing visual-based learning materials, such as text and images. Although teachers make efforts to deliver the material verbally, time constraints and classroom methods are often inadequate for fully exploring the material. This finding indicates that visually impaired children need applications that provide audio-based content, allowing them to access materials at any time and support independent learning (Anggryani et al., 2022)

Education experts also suggest that, in addition to providing access to materials, these applications must focus on interactivity to enhance student engagement (Adiyono et al., 2024). Text-to-speech (TTS) applications play a crucial role in helping visually impaired children understand content that is challenging to access through traditional methods. This technology converts text into audio, enabling blind children to access information more easily and effectively. Furthermore, the use of speech recognition technology allows visually impaired children to interact independently with the applications, which, in turn, can boost their independence and confidence. This is particularly important in an increasingly technology-dependent world, ensuring that visually impaired children are not left behind in societal advancements (Susanti et al., 2023)

The results of the needs analysis indicate that audio-based applications for visually impaired children should prioritize two key aspects: first, converting text-based learning materials into a clear, easy-to-understand voice format; and second, including interactive features that enable visually impaired children to engage independently with the application. These findings align with the recommendations of Tjahyanti et al. (2024), who emphasized the importance of designing simple, user-friendly applications to enhance accessibility for people with disabilities. By integrating these two elements, audio-based applications like " *Listen to Me* " can provide an inclusive and effective solution for supporting the learning of blind children.

Design Stage

Main Menu

The initial appearance of the *Listen to Me* app is designed with a simple interface and high accessibility, ensuring ease of use for visually impaired users. The background employs high-contrast colours to assist users with partial sight in distinguishing elements on the screen. Upon opening the app, an automated audio system provides clear verbal instructions on how to select the menus, enabling users to immediately understand the first steps in using the app. The design of the buttons and icons is simplified, with larger sizes and strategic placement for easy access, ensuring both convenience and efficiency in navigation. Additionally, the app includes audio feedback that confirms every selection or interaction with an element on the screen, reinforcing the user's independence and confidence. Overall, the *Listen to Me* home screen is crafted to offer an inclusive experience, empowering visually impaired children to learn with ease and independence. The initial display shows the words “Welcome to Listen to Me Application,” followed by a voice/audio that further explains the app’s functions and

instructions for use. This voice guides the user to select the first option in a clear, easy-to-understand manner, ensuring they can confidently begin their learning journey.

Instructions

Once the words "Welcome to Listen to Me Application" appear, the user will receive instructions on how to use and navigate the app. In the displayed image, each colour corresponds to a different sound, as follows: **Red**: Swipe up to go to the next chapter; **Blue**: Swipe down to return to the previous chapter; **Yellow**: Swipe right to go to the previous material; and **Green**: Swipe left to go to the next material.

The "User Guide" menu offers an interactive audio guide that explains how to use the app's features. The guide is organized in a step-by-step format, with clear narration and the option to repeat each instruction. Additionally, each button in this menu is accompanied by voice feedback, reinforcing the user's interaction with the app. This feature enables visually impaired children to understand the app's functions independently, without requiring assistance from others.

Material Menu

The Materials menu of the *Listen to Me* app provides an interactive learning experience designed for visually impaired children. It offers 11 categories: *Alphabet, Numbers, Colours, Fruits, Animals, Transportation, Objects, Days, Months, Body Parts, and Self Introductions*. Each category features detailed interactive audio that explains the material, including both spelling and meanings. The spelling feature helps children recognize letters and correctly spell words, enhancing their phonetic understanding. Additionally, the meanings provide context, allowing children to better understand how words are used in everyday communication. Through listening, children can improve their listening skills, expand their vocabulary, and develop their speaking abilities by repeating the words they hear. Each category concludes with an exercise to assess the child's understanding of the material. These exercises consist of simple questions, such as identifying the meaning of a word learned. The aim is to reinforce the child's memory and build confidence in their grasp of the material. With this approach, the Listen to Me app not only promotes passive learning but also encourages active interaction and engagement from its users.

Coding/Development Stage

During the development of the Listen to Me application, coding successfully created an audio interface that is easy to use for visually impaired children. The app is built with an Android-based framework and includes text-to-speech functionality, allowing real-time audio feedback, which helps users access learning materials more easily. The app features three main functions: letter recognition, word spelling, and word meaning, all of which are presented in a clear and easy-to-understand voice. In addition, the voice navigation system enables users to navigate menus and select features using only audio, without the need for visual displays. The coding process also focused on ensuring the app's stability and responsiveness. The code structure was designed to be modular, making it easier to add new features in the future. The voice output is designed to sound natural, with adjustments to speed and intonation for better listening comfort. The speech processing system can handle different pronunciations, improving speech recognition accuracy. This approach makes the Listen to Me app a valuable technology solution that meets the specific needs of visually impaired children.

Testing Stage

The Listen to Me application was tested on four visually impaired students at SLB Pringsewu to evaluate its performance and user-friendliness. The test included learning activities such as letter recognition, word spelling, and understanding word meanings. The results indicated that the app functions effectively, achieving a voice accuracy rate of 95%. The text-to-speech feature works optimally, producing clear and understandable audio. Moreover,

the voice-based navigation system allows students to independently navigate all app features without the need for visual assistance, significantly improving their learning experience.

Discussion

The *Listen to Me* application serves as a significant technological advancement in inclusive education, particularly in improving the literacy and listening skills of visually impaired children. Built on an Android platform and designed with accessibility in mind, the app focuses on the use of audio-based learning features to facilitate the educational development of students who cannot rely on traditional visual-based instructional materials. Central to the app's pedagogical model is its use of text-to-speech (TTS) technology, which enables real-time audio output of learning content such as letter names, word spelling, and word meanings. This design allows visually impaired learners to develop foundational literacy skills without the need for visual prompts, thereby supporting cognitive engagement through auditory pathways. According to Umifa et al. (2022), the use of such voice-based educational applications significantly enhances the language acquisition process in children with visual impairments, as these children tend to possess heightened auditory perception, which the application strategically leverages.

The effectiveness of *Listen to Me* lies not only in its content delivery but also in its functionality that encourages student independence and confidence. The finding is inline with Villalba et al. (2024) who inform that one of its most notable features is voice-guided navigation, allowing users to explore and interact with the app's interface without external assistance. This fosters autonomy, a vital psychological and developmental component for learners with disabilities. By navigating menus, selecting tasks, and receiving feedback via voice commands, users become active participants in their own learning journey (Yudhistoro & Silalahi, 2021; Taufiqurrahman et al., 2022). This user-centered approach reflects inclusive instructional design principles, which emphasize the removal of barriers and the enhancement of student agency. The ability to self-navigate also contributes to a more personalized learning experience, as students can choose content suited to their learning pace and needs.

Another major strength of the *Listen to Me* application is its potential to improve listening comprehension and auditory discrimination skills. These abilities are essential not only for language learning but also for broader academic and social participation. By listening to clearly articulated letter names, word sounds, and definitions, students enhance their phonemic awareness and vocabulary acquisition (Saputra et al., 2022; Siahaan et al., 2020). The interactive nature of the app encourages repeated listening and response, enabling learners to process information more deeply and retain it more effectively. In practical classroom settings, this can result in improved performance in listening tests, greater participation in oral activities, and a stronger foundation in reading and writing skills. Moreover, the pronunciation feature, which allows learners to adjust the speed of audio output, supports differentiated instruction, accommodating students with various cognitive and linguistic processing speeds.

Feedback gathered during pilot testing at Sekolah Luar Biasa (SLB) Pringsewu further validated the effectiveness of the application in real educational contexts. Students reported that the audio was clear and the voice sounded natural, which made the learning process comfortable and engaging. The speed adjustment feature was especially appreciated by both students and educators, as it allowed for flexible pacing that catered to individual comprehension levels. Teachers observed increased participation from students who typically struggled with attention or motivation, suggesting that the interactive and auditory nature of the app might stimulate greater interest in learning activities. These findings are consistent with research by Manu and Masan (2020), who found that the integration of TTS technology in English learning enhanced the engagement and comprehension levels of students with disabilities.

Despite these successes, the research team identified several areas for further enhancement of the app. While the voice navigation system worked effectively in quiet

environments, some students experienced delays or errors in recognition when using the app in noisy settings. This highlights the need for improved speech recognition algorithms that can function reliably even when background noise is present. Enhancing this feature would be particularly beneficial in real-world classroom environments, where complete silence cannot always be guaranteed (Putri, 2020; Tjahyanti et al., 2024). Additionally, optimizing the app's response time for commands would improve user experience, making it feel more seamless and intuitive. These technical improvements would ensure that the app remains not only accessible but also highly efficient and user-friendly in diverse learning contexts.

The impact of *Listen to Me* also extends beyond academic achievement to include socio-emotional and behavioral benefits. The sense of independence fostered by the app contributes to a stronger sense of self-efficacy in visually impaired learners. As they gain confidence in navigating digital tools and completing tasks without assistance, students begin to view themselves as capable learners. This shift in self-perception can have long-term benefits in educational persistence, motivation, and even future employment readiness (Manu & Masan, 2020). Inclusive tools like *Listen to Me* do not merely fill the gap in educational resources; they transform the way students perceive their abilities and role in the learning process.

In broader terms, the success of *Listen to Me* underscores the importance of integrating inclusive technologies in national education policies and curriculum development. As inclusive education gains global recognition, there is a pressing need to ensure that technological innovations are not only available but also adapted to diverse learner needs. Applications like *Listen to Me* illustrate how digital tools can bridge the accessibility divide, making education truly equitable. This aligns with the vision set out by educational inclusion advocates, who argue that every student—regardless of disability—has the right to quality education supported by appropriate technology (Ganesan et al., 2022; Villalba et al., 2024). By supporting visually impaired learners in mastering literacy skills through audio interaction, this app exemplifies how inclusive design can yield practical, transformative outcomes in classroom settings.

The long-term goal of the *Listen to Me* initiative is to support broader educational transformation through scalable, evidence-based solutions. As more students engage with the app, data can be collected to further refine its features and expand its capabilities, such as integrating additional subjects, languages, or gamified elements to increase user motivation. Partnerships with special education institutions, app developers, and governmental bodies can accelerate its adoption and ensure sustainable impact. The current research provides a foundation for future studies that might explore comparative analysis between traditional instruction and *Listen to Me*-based instruction, examining improvements in academic performance, retention rates, and communication skills among visually impaired students.

In conclusion, the *Listen to Me* application demonstrates strong effectiveness in facilitating learning among visually impaired children, particularly by enhancing listening comprehension and foundational literacy through its interactive, audio-based design. By fostering student independence, adapting to individual learning needs, and providing accessible educational content, the app represents a meaningful step toward equitable learning opportunities. Though some technical refinements are still needed, the app's contribution to inclusive education is evident in its positive impact on student engagement, skill acquisition, and self-confidence. As educational systems increasingly embrace digital innovation, tools like *Listen to Me* serve as vital models for designing accessible learning technologies that truly meet the needs of all learners.

CONCLUSION

The conclusion of this research shows that the *Listen to Me* App. is an innovative solution that effectively supports English language learning for visually impaired children in the digital age. Using audio-based technology, the app helps children learn English in an

inclusive and efficient way. The text-to-speech feature enables them to independently learn letter recognition, word pronunciation, and word meanings without needing to rely on sight. This approach makes the app a valuable tool for overcoming the challenges visually impaired children face in accessing appropriate learning materials.

The trial results with visually impaired students showed that *Listen to Me* effectively improved their understanding of the learning materials. Users provided positive feedback, emphasizing how the app helped them learn new vocabulary, understand the phonetic structure of English, and improve their listening and speaking skills. This feedback demonstrates that the app not only meets the educational needs of visually impaired children but also offers an interactive and self-directed learning experience. Consequently, *Listen to Me* Me has significant potential to become an effective, inclusive, and sustainable learning tool for visually impaired children in the future.

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