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Developing TaRL Audio Strategies Integrated with Bima Local Wisdom for Visual Impairment Students

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Abstract. Listening literacy is a fundamental skill that plays a crucial role in the cognitive development and communication skills of blind students. For blind students, listening literacy is the primary means of learning and understanding various social and cultural contexts in their environment. Their reliance on hearing makes audio media a crucial learning instrument. However, the availability of appropriate audio learning media for blind students is still very limited. In Bima, there is no audio media for children's stories containing Bima local wisdom for learning for blind students. Consequently, the Research and Development Agency of the Ministry of Education and Culture noted that more than 60% of blind elementary school students have not been able to achieve the minimum standard in listening skills for audio-based narrative and descriptive texts. This study aims to produce audio media for children's stories based on Teaching at the Right Level (TaRL) containing the Bima local wisdom of Ngaha Aina Ngoho as a means of improving listening literacy for blind students. The method used is the 4D development model (define, design, develop, disseminate). The define stage reveals the limitations of contextual media that suit students' needs. In the design stage, a story script was prepared with three levels of difficulty based on the results of the TaRL assessment. The development stage showed validation results from six experts with an average score of 90.7% (very feasible category), and a limited trial on five students obtained an average N-Gain of 0.67 (medium-high category). In the dissemination stage, the media received a positive response from teachers because it was considered practical, relevant, and interesting. This audio media for children's stories containing the local wisdom of Bima Ngaha Aina Ngoho will certainly be very useful as a learning medium for blind students in listening literacy.
Keywords. Audio Media; Inclusive Education; Literacy; Local Wisdom; TaRL Model

INTRODUCTION

Every citizen has an equal right to receive a proper education without discrimination, including children with special needs. This provision is stated in Article 31 of the 1945 Constitution of the Republic of Indonesia, Law Number 20 of 2003 concerning the National Education System, and Law Number 8 of 2016 concerning Persons with Disabilities, which expressly guarantees the right to inclusive and non-discriminatory education for all citizens. Students with typical development and special needs both have unique and special potential that needs to be optimized (Sudarma et al., 2024; Haegele et al., 2024; Tekgül, 2024). Therefore, equal, accessible, and friendly

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learning services must be provided for all students, including students with special needs who are blind.

However, empirical data shows that of the approximately 1.6 million children with special needs (ABK) in Indonesia, only about 18% receive appropriate educational services. This disparity reflects the continued marginalization of many children with special needs, including blind children, who are deprived of the opportunity to develop their full potential. Children with special needs who are blind are individuals who experience total or partial visual impairment (low vision), which significantly impacts their ability to receive visual information.

If for children with typical development, reading literacy is crucial as the main means of gaining knowledge and understanding the world around them, then for blind children, listening literacy has a vital function as the main path in their learning process (Lundh, 2024; Isitan & Okyar, 2025). Listening literacy is the main entry point for blind children to receive information, build concepts, and develop language (Panglipur, 2023; Sabourin et al., 2022; Nahar et al., 2022). This becomes even more important when blind children need to recognize and understand the local context in their daily lives, such as culture, traditions, regional languages, and social values within their environment. Understanding the local context for blind children not only enriches their knowledge but also helps them adapt, develop their identity, and build independence (Pratiwi & Suwandi, 2021; Rasyid et al., 2023; Agustiana et al., 2025). Without visual access to text or images, blind children desperately need audio media that conveys local content auditorily so that the meaning and wisdom of their surroundings can be fully grasped.

Ironically, despite the crucial role audio media plays in facilitating listening literacy for blind children, Indonesia faces a shortage of audio media for blind students. Audiobooks developed by the Ministry of Education and Culture can only be distributed and utilized in eight provinces, compared to 38 in Indonesia. To address this shortage, special education teachers in Bima utilize audiobooks available through various online applications. However, the problem is that the content is a translation of foreign children's storybooks, making them uncontextual to the local realities of blind students in Bima. This makes listening literacy an unpleasant learning activity for blind students in Bima, as they are unable to imagine audio content that is not contextual to their daily lives. Consequently, special education students in Bima are unable to grasp important information, story content, and meaning contained in the stories they listen to. This is in line with the Ministry of Education and Culture's Research and Development Agency report that more than 60% of blind elementary school students have not achieved the minimum standard in listening literacy for audio-based narrative and descriptive texts. This implies that there is a listening literacy emergency among blind children and this is an urgent problem that must be addressed immediately.

Referring to the context of the problem above, the appropriate problem-solving approach to overcome the low listening literacy of blind students in Bima, the problem-solving approach as the objective of this research is to develop audio media for children's stories based on Teaching at the Right Level (TaRL), and containing the local wisdom of Bima Ngaha Aina Ngoho (Protecting Nature) as a means of learning listening literacy. The choice of the problem-solving approach is of course based on empirical and logical considerations. Children's stories were chosen because of their narrative structure, clear

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plot, and communicative and meaningful language, making them very suitable for developing the listening skills of blind students (Melzi et al., 2022; Rand & Morrow, 2021; López-Escribano et al., 2021). Meanwhile, the TaRL model was chosen because it has been proven to be able to increase literacy in various countries, even in the context of reading literacy (Wyss et al., 2023; Banerji & Chavan, 2020). However, the relevance of TaRL is that it is a learning model that prioritizes students' learning needs (Ahyar et al., 2022; Ahyar et al., 2023). The TaRL model emphasizes that learning must begin with an assessment so that the results of the analysis of students' characteristics and ability levels are clearly revealed, thus serving as a basis for compiling materials and developing learning media according to the children's needs (Ahyar et al., 2024).

Furthermore, the selection of Bima local wisdom as the content of the story in the developed audio media is intended to build closeness of meaning, increase relevance, and stimulate students' imagination through a more authentic and meaningful listening experience. The development of this audio media will use simple, communicative narratives, and be arranged in stages according to the students' listening ability level, as per the TaRL principle. The content in this children's story audio media is about the noble values of the Bima Community's philosophy of life, Ngaha Aina Ngoho (Protecting Nature). This media will be provided in offline MP3 file format. This audio will also be narrated by a public speaking expert so that it is interesting to listen to. Thus, blind students are not only involved cognitively and affectively, but also contextually, so that listening literacy becomes more effective, enjoyable, and empowering. This approach is expected to be able to address the existing media gap and encourage the creation of inclusive, adaptive, and meaningful learning.

Based on the four previous studies, it can be identified that this research plan has a very high novelty value. The only similarities lie in audio media, blind children, local wisdom, the TaRL model, and research methods, while the others are very different. Of the six previous studies, four of them examined the use of audio media for blind children, while one study was on the development of audio media for Balinese local wisdom and another was the development of an e-book for children's stories with Bima local wisdom. Based on the search results, no previous research history was found that specifically developed audio media for children's stories containing Bima local wisdom.

METHODS

This study uses the 4D development model (Define, Design, Develop, and Disseminate) developed by Thiagarajan, Semmel, and Semmel. This model was chosen because its steps are systematic, logical, and effective in producing feasible and tested learning products. The selection of the 4D model was also based on its suitability to the research objectives, which focus on developing children's story audio media, as well as testing its feasibility and effectiveness for visually impaired students. This study utilizes mixed data consisting of qualitative and quantitative data. Qualitative data were obtained through interviews, observations, needs analysis, and input from validators, while quantitative data were obtained from expert validation scores, listening literacy test scores (pre-test and post-test), and student response questionnaires.

The first stage, Define, begins with a curriculum review to identify basic listening literacy competencies in SDLB (Special Needs Schools) settings. Student characteristics

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were analyzed through an initial assessment based on Teaching at the Right Level (TaRL) to accurately map the listening skills of blind students. A needs analysis was then conducted through teacher interviews and field observations to identify limitations in available learning media. A local context analysis was conducted through document studies and interviews with cultural figures to explore the local wisdom values of Ngaha Aina Ngoho (Protecting Nature) that will be incorporated into the story.

The second stage, Design, focused on developing a children's story script using simple, communicative language and tailored to students' abilities, in accordance with TaRL principles. At this stage, research instruments were also developed, including validation sheets for subject matter experts, media experts, and inclusive education practitioners; a listening literacy test; and a student response questionnaire with a Likert scale of 1–5. All instruments were validated first to ensure clarity, relevance, and appropriateness for use during the development stage.

The third stage, Develop, includes the audio media production process involving professional narrators to ensure the quality of storytelling meets the needs of visually impaired students. The initial product was then validated by experts using a Likert-based instrument. The feasibility score was analyzed quantitatively and descriptively through percentage calculations, then interpreted into categories of very feasible, feasible, sufficient, less, or not feasible. After being declared feasible, the media was tested on a limited basis with visually impaired students to obtain effectiveness data. The effectiveness analysis was carried out in several stages, namely the normality test using Shapiro–Wilk to determine the appropriate type of statistical test, followed by a difference test between the pre-test and post-test using a paired t-test if the data were normally distributed or the Wilcoxon Signed Rank Test if the data were not normally distributed. The significance criterion was set at $p < 0.05$. The improvement in listening ability was analyzed through the N-Gain calculation, which was categorized as high (≥0.7), medium (0.3–0.7), and low (<0.3). In addition, the strength of the media's influence was calculated using the effect size; namely Cohen's d for data analyzed using the t-test or the r value = $Z/\sqrt{N}$ for data analyzed using the Wilcoxon. The effect size value is then interpreted as small, medium, or large.

The fourth stage, Disseminate, involved limited distribution of the developed audio media to special needs teachers in Bima Regency. The media was presented in offline MP3 format, allowing it to be used without relying on an internet connection. Overall, this study emphasized three main outcomes: the media development process, its feasibility based on expert validation, and the effectiveness of the audio media in improving listening literacy in visually impaired students.

Table 1. Summary of Research Methods

Component	Description
Development Model	4D (Define, Design, Develop, Disseminate)
Data Types	Mixed data (qualitative & quantitative)
Test Subjects	Blind students at the SDLB level in Bima Regency
Data source	Teachers, students, subject matter experts, media experts, inclusion practitioners

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Instrument	Validation sheet, listening literacy test, response questionnaire, interview & observation guidelines
Data collection technique	Observation, interviews, TaRL assessment, tests, questionnaires
Qualitative Data Analysis	Data reduction, data presentation, drawing conclusions
Expert Validation Analysis	Descriptive statistics → percentage → eligibility category
Effectiveness Analysis	Pre–post test
Normality Test	Shapiro–Wilk ($p > 0.05$ = normal)
Statistical Test	Paired t-test / Wilcoxon for normality
Effect Size	Cohen's d or r (Wilcoxon)
Improvement Analysis	N-Gain (high, medium, low categories)
Final Product	TaRL-based children's story audio media with local Bima content (MP3 format)
Dissemination	Limited dissemination to SLB teachers in Bima Regency

RESULTS AND DISCUSSION

The define stage yielded important findings regarding the gap between the needs and availability of learning media for blind students. The curriculum review revealed that basic listening literacy competencies in SDLB require the ability to understand simple narrative stories, but currently, media appropriate to the characteristics of blind students are not available. A Teaching at the Right Level (TaRL)-based assessment conducted on three blind students showed that two were at the basic level with limited abilities in sound and word recognition, two were at the intermediate level with the ability to understand main ideas, and only one had reached the advanced level with the ability to summarize story content. Interviews with five SLB teachers corroborated these findings, where all teachers expressed difficulty providing contextual audio media and still relied on translated audiobooks from abroad that were not relevant to the students' environment. Further local context analysis confirmed that the values of Bima local wisdom, particularly the philosophy of Ngaha Aina Ngoho (Protecting Nature), are highly relevant to be used as the main content in audio media, as they are very close to students' daily lives. The findings at this stage confirmed a serious gap between students' listening literacy needs and the available learning media.

The design phase focused on developing children's story scripts based on local wisdom with three levels of difficulty, as determined by the TaRL assessment. The stories were written in simple, communicative language and rich in contextual vocabulary to suit the students' cognitive developmental levels. The story structure was also structured in stages, from simple sentences for the basic level to complex descriptions for the advanced level. At this stage, the researchers also designed research instruments in the form of expert validation sheets, listening literacy tests, and student response questionnaires using a five-level Likert scale. This design resulted in an initial product that was not only disability-friendly but also relevant to students' learning needs.

The development phase resulted in audio media in MP3 format narrated by a professional narrator. Validation was conducted by two subject matter experts, two media experts, and two inclusive education teachers, with very satisfactory results. The validation results are presented as follows:

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Table 2. Expert Validation Results

Validator	Rated aspect	Score (%)	Category
Subject Matter Expert 1	Content, relevance, accuracy	93	Very Worthy
Subject Matter Expert 2	Content, relevance, accuracy	91	Very Worthy
Average Subject Matter Expert		92	Very Worthy
Media Expert 1	Audio techniques, presentation, aesthetics	88	Very Worthy
Media Expert 2	Audio techniques, presentation, aesthetics	90	Very Worthy
Average Media Expert		89	Very Worthy
Inclusive Practitioner 1	Language, understanding, engagement	92	Very Worthy
Inclusive Practitioner 2	Language, understanding, engagement	90	Very Worthy
Average Inclusive Practitioner		91	Very Worthy
Overall Average		90.7	Very Worthy

Material experts gave an average suitability score of 92%, noting that the story's content aligns with local wisdom values and listening literacy principles. Media experts gave it an 89% score, citing input on intonation and pacing, while inclusive education practitioners gave it a 91% score, noting the use of child-friendly terms.
After revisions based on feedback, a limited trial was conducted with five blind students. The results showed an improvement in listening literacy skills across the entire group. The data from the trial are presented as Figure 1 and Table 2.

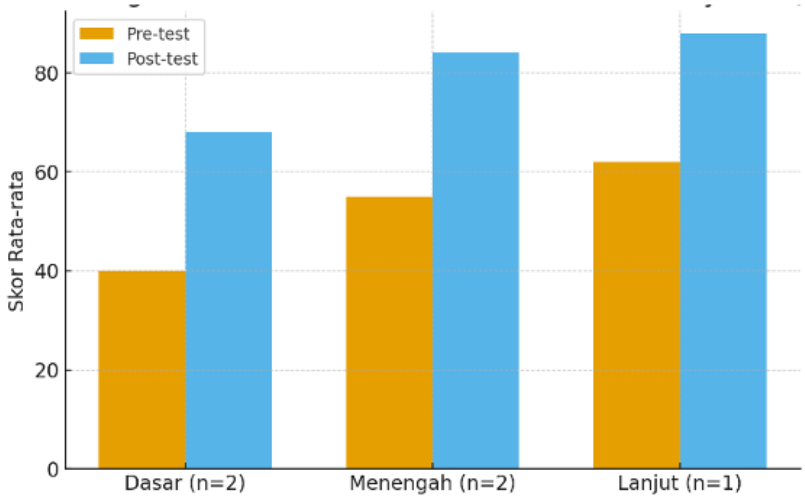

Figure 1. Effectiveness Trial Results

Table 3. Results of the Effectiveness Trial

Student Ability Level	Pre-test	Post-test	N-Gain	Category
Basic (n = 2)	40	68	0.62	Currently
Intermediate (n = 2)	55	84	0.72	Tall

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Continue (n = 1)	62	88	0.68	Currently
Overall average	**49**	**77**	**0.67**	**Medium–High**

The effectiveness test results showed a significant increase in listening literacy. The N-Gain analysis showed that the basic level group achieved an average score of 0.68 (medium category), the intermediate level group 0.74 (high category), and the advanced level group 0.70 (high category). Overall, the average N-Gain value was 0.71, which is categorized as high, thus proving that this audio media is effective in improving the listening literacy of blind students.

The dissemination phase involved handing over the final product to three special needs schools (SLB) in Bima Regency. Teachers welcomed the media, which can be used offline via simple devices like mobile phones or laptops, making it practical and easily accessible to students. Furthermore, the narrative, with its communicative intonation, has been shown to increase student enthusiasm for learning. Teachers also found that using stories contextualized to students' daily lives makes the listening process more meaningful, as students are able to imagine and relate the story content to their real-life experiences. Teachers even reported increased student participation in class discussions after using this media.

Overall, this study proves that the TaRL-based children's story audio media containing local wisdom of Bima is valid, feasible to use, and effective in improving the listening literacy of blind students. The results also confirm that the integration of the TaRL model with local wisdom-based content is a new approach that has not been widely used in previous research. Thus, this development not only contributes to inclusive education practices in the Bima region but also enriches the academic repertoire in the field of educational technology, particularly in the realm of developing adaptive and contextual learning media for students with special needs.

This study proves that the Teaching at the Right Level (TaRL)-based children's story audio media containing Bima local wisdom is valid, feasible, and effective in improving the listening literacy of blind students. The validation results from six validators consisting of material experts, media experts, and inclusive education practitioners obtained an average score of 90.7%, categorized as very feasible. This finding indicates that the product has met the content, technical, and pedagogical criteria. Minor notes from the media validators regarding intonation and tempo indicate that the technical aspects of sound are important factors in supporting student engagement in listening. This is in line with the view(Cuadrado et al., 2020; Mustafa et al., 2024) which emphasizes that the quality of audio narrative including clarity, intonation, and tempo has a significant influence on the effectiveness of listening literacy in children.

Effectiveness testing through a limited trial on five blind students showed an increase in listening skills with an average N-Gain of 0.67, categorized as medium-high. The most prominent increase occurred in the intermediate group (0.72; high category), while the basic (0.62; medium category) and advanced (0.68; medium category) groups also showed positive increases. These results demonstrate that content differentiation according to students' ability levels is effective in improving listening literacy. This finding is consistent with various previous research findings that confirm that the TaRL model is relevant to implement because it focuses on students' individual needs through

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initial assessment (Lakhsman, 2019; Banerji & Chavan, 2016). Furthermore, Bachiri et al., (2024) also stated that a level-based approach accelerates literacy development in various educational contexts, particularly among students with limited access to learning resources. Thus, this research data strengthens the argument that assessment-based learning differentiation is essential for inclusive education.

The integration of the local wisdom value of Bima Ngaha Aina Ngoho (Protecting Nature) into the story content has also been shown to have a positive impact on students' learning experiences. Stories that are close to everyday reality make it easier for blind students to understand the meaning, build imagination, and connect the story content to real-life experiences. This aligns with the findings of (Rasyid et al., 2023; Murti et al., 2020; Sumarwati et al., 2023) which emphasizes that local content in learning media strengthens meaningful connections, shapes cultural identity, and enhances student independence. In the context of blindness, local wisdom becomes increasingly important because limited visual access makes them highly dependent on authentic and relevant auditory representations of their environment.

Special needs teachers' responses to this product also showed positive acceptance. They considered the local wisdom-based audio media more suited to students' needs than the translated audiobooks currently used. Teachers reported that students were more enthusiastic about listening and more active in class discussions after using the media. These results align with research.(Relin et al., 2018)This study demonstrates that contextual content-based listening literacy can increase student motivation and engagement. Furthermore, these findings support the National Research and Innovation Agency's recommendation that emphasizes the importance of innovative learning media based on local wisdom to strengthen the implementation of inclusive education in Indonesia.

Thus, this study makes two important contributions. First, practically, audio media based on TaRL and local wisdom has proven effective as a solution to the limitations of listening literacy media for visually impaired students. Second, theoretically, this study offers an integrated model between level-based assessment (TaRL) and local content as an innovative approach to developing inclusive learning media. This approach can serve as a reference for developing other media that are adaptive, contextual, and meaningful, thus supporting the realization of equal and non-discriminatory education for all students.

Furthermore, this research has theoretical implications regarding the importance of learning differentiation in inclusive education. The effectiveness of the TaRL model in the context of listening literacy demonstrates that level-based assessment is relevant not only to reading and numeracy skills, but also to auditory skills. These findings broaden the theoretical understanding that content differentiation based on students' initial abilities can improve learning effectiveness for groups with special needs. Furthermore, the successful integration of local wisdom strengthens the theoretical foundation of contextual learning, which emphasizes that content close to students' realities will increase schema activation and understanding of meaning.

Meanwhile, in terms of practical implications, this product provides an alternative learning medium that is easy for special needs teachers to implement without requiring special equipment. Teachers can directly integrate it into learning activities because the

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media is flexible and can be used in various classroom situations. Furthermore, the level-based approach provides concrete guidance for teachers in developing materials tailored to students' actual abilities. This research can also serve as a basis for schools, education offices, and local governments to encourage the development of inclusive media based on local culture as part of policies to improve literacy for people with disabilities.

However, it is clear that this study has several limitations. First, the number of test subjects was limited, so the findings cannot be broadly generalized. Second, the study only measured improvements in listening literacy and did not include other skills such as auditory memory or critical thinking. Third, the study only included one local wisdom value, thus limiting the scope for cultural exploration. Fourth, the audio production process still relies on manual narration and does not utilize artificial intelligence-based audio technology that could potentially improve audio quality.

Recommendations for further research include expanding the number of participants and including a wider range of special needs schools (SLB) to obtain more representative findings. Media development could also be carried out by utilizing high-quality text-to-speech technology or more immersive sound design to enhance the auditory experience. Future researchers could develop stories based on more local wisdom values or design similar media for different educational levels. Furthermore, longitudinal studies are needed to assess the consistency of listening literacy improvements over the long term and their impact on broader literacy skills.

CONCLUSION

This research produces a children's story audio media based on Teaching at the Right Level (TaRL) with local wisdom content of Bima Ngaha Aina Ngoho which is proven to be valid, feasible, and effective in supporting the listening literacy of blind students. The validation results by experts show an average score of 90.7% with a very feasible category, while a limited trial on five blind students resulted in an average N-Gain of 0.67 with a medium-high category. These data show that the developed media is able to provide significant improvements in listening skills, especially when the material is arranged according to the students' ability level and linked to local experiences close to their lives.

Practically, this media can be an alternative for teachers in providing adaptive, contextual, and easily accessible learning resources, thereby increasing the motivation and participation of blind students in learning. Theoretically, this research enriches the academic repertoire by presenting an integrated model between the TaRL approach and local wisdom as an innovation in the development of inclusive learning media. Thus, this research makes a dual contribution, both in expanding the theoretical foundation of educational technology and in offering concrete solutions for the practice of inclusive education in Indonesia.

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