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Kinesthetic Audio Media Innovation with Local Wisdom for Reading Literacy of Visual Sensory Disabilities

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ABSTRACT

The difficulty of accessing visual literacy learning for people with visual sensory disabilities is a major challenge that must be addressed. This challenge presents other problems, such as a lack of ability to understand the main idea and important information in a text. Inclusive and innovative learning with appropriate learning strategies is highly necessary for visually impaired individuals. This research develops and tests the effectiveness of audio-kinesthetic-based inclusive learning media with local wisdom content. This is intended as a means of improving reading literacy skills for visually impaired individuals, implemented at the Social Service Home for the Visually Impaired (PPSDSN) Pendowo, Kudus Regency. A descriptive qualitative method with a case study research design was chosen to gain a deeper understanding of the application of audio-kinesthetic media based on local wisdom in a natural context. The research results show an 85% increase in information comprehension and the ability to retell the content of the reading among participants. The integration of local cultural elements into audio-kinesthetic media, namely folk tales, gamelan rhythms, and simple kinaesthetic movements, was able to increase attention, active engagement, and the ability to understand main ideas in visually impaired participants. These results indicate that audio-kinesthetic media loaded with local wisdom can strengthen emotional bonds, social communication, and functional literacy skills in visually impaired individuals.

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1. INTRODUCTION

In Indonesia, visually impaired individuals still face many challenges in accessing literacy education, especially in rural areas with limited resources and infrastructure, UNESCO (2023) states

that only 38% of people with disabilities worldwide have access to adequate literacy programs within the framework of Sustainable Development Goal (SDG) 4 on quality education. Similar disparities are also evident in Indonesia: data from the Central Bureau of Statistics (Badan Pusat Statistik, 2022) records over 57,124 individuals with visual impairments, yet their participation in formal literacy education is only around 35.8%, significantly below the national average. Although the government has protected the right to education and equal protection under the Government Regulation of the Republic of Indonesia Number 13 of 2020, which supports inclusive learning for people with disabilities. Uneven access to technology, innovative learning resources, and teachers who are specially trained in handling students with special needs in Indonesia, one of which is Kudus Regency, is a tough challenge that must be faced to ensure the same literacy opportunities.

Observations at the Pendowo Centre for the Social Service of the Visually Impaired (PPSDSN) reveal that traditional verbal lectures still dominate teaching methods, and few multisensory media are employed. Low learning motivation and emotional engagement are a result of reliance on conventional approaches, which ultimately hinder the ability to understand the main ideas of reading texts. The results of in-depth interviews with teachers and therapists indicate that integrating sensory elements such as movement, rhythm, and sound with literacy can help meet the sensory needs of individuals with visual sensory disabilities. Positive responses to local content-based learning media and multisensory activities are higher compared to conventional learning media that rely solely on verbal instruction.

Inclusive education has been a top priority in global development since the United Nations (UN) Convention on the Rights of Persons with Disabilities. This aims to ensure equality of equal access to education, especially for students with special needs. According to (May Alrudayni, 2025), The primary goal is to ensure that all students fully participate in the learning process without discrimination or exclusion. This concept goes beyond simply physically entering general classrooms. It demands structural, pedagogical, and cultural changes in the education system to meet individual needs and reflect human rights and social justice. It also makes all students an integral part of the school community (Iarskaia-Smirnova, E. et al., 2025; Wibowo et al., 2024; Fathurohman, Setiawaty, et al., 2024; Fathurohman, Wijayanto, et al., 2024). The emergence of inclusive education in the 1970s marked a shift in approach from segregation to integration (Buchner & Proyer, 2020; Richard Rose, 2022).

This study strengthens the findings of Hartley dan Allan (2020) regarding the effectiveness of the multisensory approach in improving the conceptual understanding of students with special needs. Inclusive learning must present a comfortable learning environment, mutual respect, accept differences, and be close to the surrounding culture, so that it is able to provide meaningful learning (Markey & Okantey, 2019). In line with that statement, the local cultural-based learning approach provides a rich social and emotional dimension for people with disabilities (Hermansyah dan Suryani, 2021). The importance of providing equal learning opportunities for students from various backgrounds is the main focus of inclusive learning, mainly in introducing the culture around them (Murtadlo et al., 2025; Steele & Leming, 2022). A learning experience that is able to help students with special needs understand the surrounding culture is the responsibility of the educator, so that educators must have the sensitivity and ability to integrate local culture into learning materials (Perez & Barber, 2018; Stahl et al., 2010). The integration of local culture in learning materials provides a meaningful learning experience. In addition, learning based on local culture increases learning motivation, and emotional connection for students with special needs (Dimitriadis & Kamberelis, 2020; Koh & Chai, 2020; Wegerif & Major, 2022; Monti & Graham, 2023). Spencer dan Konrad (2020) strengthens that multisensory media improves basic literacy achievement in blind students. Stein at al. (2019) stated that multimodal engagement accelerates the encoding of information in the brains of students with sensory disabilities. (Al-Azawei et al., 2020) reveals the importance of media flexibility in the context of inclusive education. In aesthetic hermeutics, the elements of local culture are able to

deepen the learning experience of students with special needs (Nielsen, 2023). This shows the importance of learning media innovation that is loaded with local culture for people with disabilities.

Multi-sensoric experience in learning is important to understand the meaning of the main learning in people with sensory disabilities (Shapiro & Stolz, 2021). Audio, kinaesthetic, and tactile activities in learning can improve students' memory and focus (Stein et al., 2019; Griffin et al., 2020; MaćKowski et al., 2023). Audio-kinesthetic media is a learning medium that integrates audio and kinesthetic elements in learning activities, namely combining two learning styles, namely involving sound, such as narration, music, or verbal instructions, as well as motor activities, such as role-playing, simulations, or direct practice (Anjaswuri et al., 2023; Sulisawati et al., 2019;Malvigie et. al., 2023). Audio-kinaesthetic media is designed to support students' learning styles, which optimally understand material through motor and auditory activities. This means students can be more actively involved in learning, understanding concepts, and mastering productive skills such as writing (Alnovgada, 2024). The integration of multi-dimensional learning media such as sound, rhythm, and body movement with technology such as haptic and tactical tools provides a more meaningful learning experience and is able to boost the spirit of learning motivation and understanding of students with special needs (Biggs et al., 2022; Hamash et al., 2024; Kasowski et al., 2021; Mukhiddinov & Kim, 2021; Puthu Vedu et al., 2025; Stone et al., 2020). Interaction with cultural elements and values increases learning motivation, cognitive ability, social inclusiveness, and understanding for visually impaired students (Wegerif & Major, 2022; Tanaka, 2021; Watkins & Noble, 2021; Roberts & Terrell, 2024). Learning media innovations such as immersive visual-tactile, platforms that can be accessed by voice, and haptic-based feedback are examples of technology integration in inclusive learning (Karpodini et al., 2025; Phia Damsma, 2024; Zhu & Yang, 2023). These findings show that integrating multi-facetted learning media with local cultural elements has a positive impact on learning for people with disabilities. In addition, this also highlights the importance of developing an inclusive learning media based on local culture that is integrated with technology for people with disabilities.

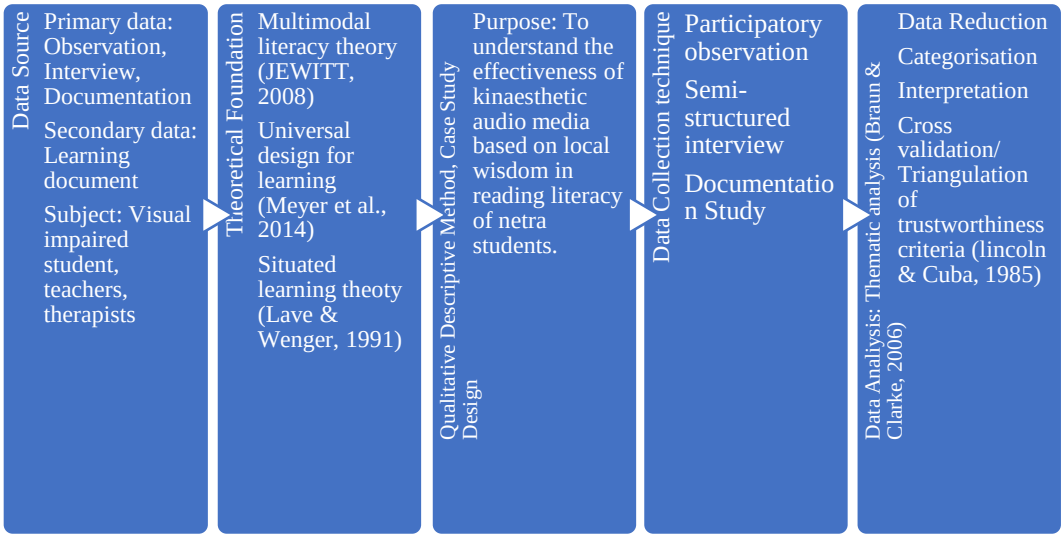
Based on all the empirical data, theories, and relevant research, the development of innovative audio-kinesthetic media based on local wisdom is a strategic need to improve the reading literacy of students with visual impairments. This approach is expected to improve functional literacy skills and strengthen cultural bonds, self-identity, and independent learning within the framework of inclusive education with social and cultural justice. So, this research aims to develop and evaluate the effectiveness of audio-kinesthetic learning media based on local wisdom as a means of improving reading literacy for visually impaired students at the Pendowo Centre for Social Services for the Visually Impaired (PPSDSN) in Kudus Regency.

2. METHODS

This study uses a qualitative descriptive method with a case study design, aiming to understand in depth the effectiveness of the application of audio-kinaesthetic media based on local wisdom in improving reading literacy in students with sensory disabilities who are blind at the Social Service Centre for the Blind Sensory Disability (PPSDSN) Pendowo, Kudus Regency. The research data consists of primary data and secondary data. Primary data includes observations of the learning process, semi-structured interviews with teachers, therapists, and students, and documentation of audio-kinaesthetic-based learning activities. Data sources involve students with sensory disabilities who are blind, who are the subjects of the intervention, supervising teachers, and therapists involved in the literacy programme. Data collection techniques are carried out through participatory observation to record learning activities directly, semi-structured interviews to explore the perceptions and experiences of informants, and documentation studies of learning process notes, lesson plans, and student work. The theoretical basis of this study refers to Multimodal Literacy Theory (Jewitt, 2008) which emphasises the importance of using various communication modes such as sound, movement, and visuals to strengthen text comprehension so that the integration of audio

and kinaesthetic media can stimulate multisensory information processing for blind students. In addition, this study refers to the principle of Universal Design for Learning (Meyer, Rose, & Gordon, 2014) which emphasises flexible and accessible learning design for all students so that local wisdom-based media can be adapted to individual needs and create an inclusive learning environment. Furthermore, Situated Learning Theory (Lave & Wenger, 1991) is used to explain how the learning process occurs contextually through the involvement of students in real social practices, where local wisdom-based literacy learning is positioned as a direct experience that connects students with their culture, environment, and community.

The data analysis technique uses a thematic analysis approach carried out in several systematic stages, namely: (1) data reduction, by selecting relevant data related to the use of audio-kinesthetic media and its influence on student literacy; (2) categorization, by grouping data into main themes such as student attention, kinesthetic involvement, and understanding of the main ideas of the reading; (3) in-depth interpretation, by explaining the relationship between categories to reveal the meaning, effects, and context of the use of media based on local wisdom; and (4) cross-validation (triangulation) between data sources and methods, in order to increase the validity and reliability of the research results. This analysis process is carried out iteratively to capture the dynamics of changes in student literacy during and after the innovative media intervention is implemented, while strengthening the conclusions by referring to the principles of credible qualitative methodology. The theoretical basis of this analysis refers to Thematic Analysis Framework from (Braun & Clarke, 2006) which provides systematic guidance for identifying, analysing, and reporting patterns or themes in qualitative data. The principles of data validity and reliability are reinforced by referring to the criteria trustworthiness of (Lincoln, 1985), which includes credibility, transferability, dependability, and confirmability, so that the research results have high scientific integrity. In addition, the interpretation process refers to Multimodal Literacy Theory (Jewitt, 2008), which views that meaning is constructed through the interaction of various modes of communication—including audio and movement—so that the analysis does not only look at text or narrative but also the kinaesthetic and auditory dimensions that are the core of local wisdom-based media in improving the literacy of students with visual sensory disabilities.



3. FINDINGS AND DISCUSSION

Findings

The results of the study showed that the use of audio-kinesthetic media based on local wisdom significantly increased engagement, attention, and the ability to understand the main ideas of reading materials in students with visual impairments. As many as 85% of students showed increased

information retention after participating in the intervention. The result were obtained based on the research data that can be seen in the following four tables.

Table 1. ed information retention after following the intervention.

Rated aspect	Operational Definition & Criteria	Percentage Increase
Student Involvement	Proportion of participants who actively participate during learning using audio-kinesthetic media.	88%
Attention of Students	The proportion of participants who are able to maintain focus and attention throughout the learning session.	86%
Ability to Understand Main Ideas of Reading	The proportion of participants who are able to identify and restate the main idea of the reading.	83%
Information Retention	Proportion of participants who showed increased information retention after the intervention.	85%

Table 2. Observation results of visual sensory disabilities.

Observed Aspects	Description of Observation Results	Observation Conclusion
Student Activity	Students are directly involved in activities, performing movements according to narrative instructions, and participating in answering reflective questions.	The majority of participants were active during the learning session.
Student Enthusiasm	Participants showed cheerful facial expressions, laughter, and spontaneous interactions while listening to the story	The enthusiasm was consistent from the beginning to

	and performing the movements.	the end of the activity.
Emotional Involvement	Participants responded to the story content with personal comments and experiences, demonstrating emotional connection to the material.	The level of emotional involvement is high, especially when the story relates to the participants' local culture.
Response to the Combination of Story and Motion	Participants are more focused and attentive when movements are directly linked to important parts of the story.	The combination of local folklore and kinesthetic movement improves focus and information retention.

Table 3. Documentation of kinesthetic activities in blind sensory disabilities.

Participant Categories	Activity Description	Ability to Restate Reading Content	Conclusion
Active Kinesthetic Participant	Perform movements according to story instructions, interact with the narrator, and follow each activity segment.	Able to re-express the contents of the reading in detail, coherently, and according to the context of the story.	Kinesthetic activities improve understanding and retention of information.
Passive Participants	Rarely does any movement, just listens to stories without active participation	Restate the contents of the reading briefly, lacking in detail, and missing some information.	Lack of kinesthetic activity results in low reading retention and comprehension.

Table 4. Results of interviews with teachers and therapists.

Observed Aspects	Interview Findings	Conclusion
Student Interest	Audio-kinesthetic media based on folklore and gamelan rhythms made students more engaged in literacy learning than conventional methods. Students appeared enthusiastic and curious about the material.	Students' interest in literacy increased significantly after audio-kinesthetic media intervention.
Student Motivation	Teachers reported increased motivation to learn. Previously passive students began to actively ask questions and respond to stories.	Audio-kinesthetic media plays a role as a trigger for students' intrinsic motivation in learning literacy.
Student Independence	Therapists observe students beginning to be able to read and understand texts independently, without always relying on teacher instructions.	Audio-kinesthetic media supports the development of learning independence in blind students.

Discussion

Base on the result, 85% of students showed increased information retention after participating in the intervention. This finding aligns with studies Spencer dan Konrad (2020) which confirms that the use of multisensory media accelerates cognitive processes in text processing in blind students, with simultaneous activation of the auditory and kinesthetic senses encouraging deeper information encoding. Similarly, research Stein et al. (2019) shows that audio and kinesthetic-based multimodal engagement can strengthen the focus of attention and extend the concentration span of students with special needs, a mechanism that is reflected in the increased response of PPSDSN Pendowo students to gamelan and folklore-based learning activities.

The integration of local wisdom elements into audio-kinesthetic media base on the result in table 2 has shown a strong influence on the formation of students' emotional connections with reading materials. This finding is reinforced by (Dimitriadis & Kamberelis, 2020) which states that local culture-based narratives have hermeneutic power in deepening the meaning and emotional resonance of learning for marginalized students. Observations show that students are more active and enthusiastic when participating in activities that combine local folklore with kinesthetic movement activities, supporting the theory of Contextual Literacy from Koh dan Chai (2020) which

states that cultural relevance in literacy significantly increases intrinsic motivation and learning engagement.

From the perspective of embodied cognition, the audio-kinesthetic approach used in this study strengthens the Embodied Learning theory put forward by Shapiro dan Stolz (2021). They emphasized that direct bodily experiences in learning activities, such as moving the body to the rhythm of gamelan music while listening to local narratives, enrich the process of internalizing the meaning of the text. Analysis of activity documentation showed that kinesthetically active students demonstrated better abilities in retelling the content of the reading than passive participants. This phenomenon was also reinforced by Monti dan Graham (2023) which states that motor integration in literacy activities increases the formation of mental representations of abstract concepts in texts.

Interviews with teachers and therapists showed that local culture-based audio-kinesthetic media successfully improved students' previously very low interest in literacy learning. Teachers reported changes in students' motivation and independence in participating in reading sessions. This supports the Multimodal Engagement theory Stein et al. (2019) which explains that multi-sensory activation encourages the transition from passive learning to more meaningful active learning. In addition, (Al-Azawei et al., 2020) also emphasizes the importance of media flexibility in inclusive education to accommodate diverse learning needs, a principle strongly reflected in this audio- and kinesthetic-based approach.

The quantitative findings of this study demonstrate that 85% of students at PPSDSN Pendowo showed measurable improvement in information retention after engaging with the local wisdom-based audio-kinesthetic media. This significant gain indicates that multisensory approaches—particularly those combining auditory and kinesthetic elements—facilitate deeper comprehension of texts rather than surface-level recall. Students were able not only to retain key details more effectively but also to demonstrate greater understanding of main ideas and contextual meaning, reflecting a marked advancement in their functional literacy skills.

Beyond cognitive outcomes, the integration of local cultural elements such as folk tales and gamelan rhythms played a central role in enhancing student attention and engagement. The rhythmic structure of gamelan provided a predictable auditory scaffold that improved concentration, while folk narratives rooted in local culture heightened emotional involvement and personal relevance. These features contributed to higher motivation, stronger cultural identity, and increased willingness to participate in literacy tasks. Such culturally grounded practices affirm the value of embedding local traditions in pedagogical design to sustain interest and foster a sense of belonging among students with visual impairments.

Theoretically, these results resonate with Embodied Learning (Shapiro & Stolz, 2021), which emphasizes bodily experience as a pathway to meaning-making, and Multimodal Engagement Theory (Stein et al., 2019), which highlights the cognitive benefits of simultaneous activation of auditory, kinesthetic, and tactile channels. They also align with the principles of Contextual Literacy (Koh & Chai, 2020), showing how cultural narratives enrich motivation and comprehension. The findings further support Roberts and Terrell's (2024) concept of Culturally Responsive Teaching, Nielsen's (2023) aesthetic hermeneutics, and Vygotsky's (2020) Zone of Proximal Development, all of which emphasize the importance of culture and sensory-based scaffolding in literacy development. Taken together, this study demonstrates that audio-kinesthetic media based on local wisdom is not only pedagogically effective in improving literacy but also strategic for advancing inclusive, socially just, and sustainable education models for students with visual disabilities.

4. CONCLUSION

Based on the research results, it can be concluded that the innovation of audio-kinesthetic media based on local wisdom can significantly improve the reading literacy of students with sensory disabilities who are blind at PPSDSN Pendowo, Kudus Regency. The use of a combination of local cultural narratives, gamelan rhythms, and simple kinesthetic activities has been shown to strengthen

students' attention, active engagement, and ability to understand and express the main ideas of the reading. As many as 85% of students showed increased information retention and verbal expression of the text content after participating in the intervention, demonstrating the effectiveness of this culturally based multisensory approach. These findings confirm the importance of adaptive and contextual learning design, in line with the theories of Embodied Learning (Shapiro & Stolz, 2021), Multimodal Engagement (Stein et al., 2019), Contextual Literacy (Koh & Chai, 2020), and Culturally Responsive Teaching (Roberts & Terrell, 2024), and are supported by various international studies that emphasize sensory and cultural integration in inclusive education for students with special needs.

Overall, this study confirms that the development of learning media that integrates audio, kinesthetic, and local values not only improves the functional literacy competency of blind students, but also strengthens their cultural identity, intrinsic motivation, and learning independence within a social and cultural justice-based educational framework. This local wisdom-based innovation also opens up strategic space to enrich inclusive education models in Indonesia, particularly in rural areas with limited access to advanced technology. Thus, the local wisdom-based audio-kinesthetic media approach developed in this study is recommended as a best practice for wider application in literacy education for people with visual sensory disabilities, as well as being a real contribution to efforts to achieve SDGs 4 on quality education for all.

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