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Development of Classroom Miniature Media to Introduce Environmental Layout to Children with Visual Impairments

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Abstract

This study aims to develop a classroom miniature media as a learning tool to introduce environmental layout to visually impaired children. The miniature media was designed to help students understand object positions, directions, and room arrangements through concrete and tactile learning experiences. The research method used was Research and Development (R&D) based on the ADDIE model, comprising needs analysis, media design, product development, implementation, and evaluation. The results showed that the classroom miniature media helped visually impaired children understand classroom layouts more easily, improved orientation skills, and created a more interactive and engaging learning process. Therefore, the classroom miniature media is considered appropriate as a learning medium for visually impaired children.

Keywords: miniature media; environmental layout; visually impaired children; learning media; spatial orientation

1. Introduction

Education is a fundamental human right guaranteed by the constitution in various countries, including Indonesia. As stipulated in Article 31 of the 1945 Constitution of the Republic of Indonesia, every citizen has the right to receive education without discrimination. This right is also in line with the 1948 Universal Declaration of Human Rights, which recognizes education as an essential means of building a just, civilized, and equal society (Aprilia et al., 2025). However, in practice, the fulfillment of the right to education still faces various challenges, particularly for vulnerable groups such as children with special needs and persons with disabilities. Children with special needs are individuals who differ from typically developing children in terms of physical, mental, intellectual, sensory, emotional, or social abilities. These differences require special attention and appropriate approaches to optimize the learning process (Hafidah & Indrawan, 2023). In the context of fulfilling the educational rights of persons with disabilities, particularly children with visual impairments, the challenges are considerably more complex due to their limited access to visual information, which predominantly characterizes conventional learning processes. Article 31 of the 1945 Constitution and Law Number 8 of 2016 concerning Persons with Disabilities guarantee the right of every citizen, including persons with visual impairments, to receive quality education without discrimination (Aprilia et al., 2025). However, in practice, children with visual impairments often still face limited access to competent educators and a lack of adaptive learning media.

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As reported by Mufidah et al. (2023) in a study involving children with hearing impairments, the use of concrete media such as miniatures has been shown to effectively improve cognitive abilities because it corresponds to students' concrete operational stage. Furthermore, Tanjung et al. (2025) demonstrated that teachers' use of miniature teaching aids through direct demonstration and repeated practice significantly increased students' interest, active participation, and memory of procedural material. A similar principle can be adapted for children with visual impairments through the development of tactile miniature-based media, considering that the sense of touch is one of their primary channels for receiving information. Therefore, fulfilling the educational rights of persons with disabilities, particularly those with visual impairments, requires not only regulations but also innovation in accessible, concrete-media-based learning strategies and a shared commitment among the government, schools, teachers, and communities to address persistent structural and social barriers.

The learning characteristics of children with visual impairments rely heavily on touch and hearing; therefore, they require learning media that are tactile, concrete, and directly explorable. Tactile miniature media, such as three-dimensional models with different textures, have great potential to help children with visual impairments understand abstract concepts that are difficult to access through lectures or audio alone. However, research on the development and effectiveness of tactile miniature media for children with visual impairments in Indonesia remains very limited. Most existing studies focus on children with hearing impairments, intellectual disabilities, or typically developing students. Therefore, this article aims to examine the effectiveness of tactile miniature media in improving the understanding and learning interest of children with visual impairments, as well as to identify supporting and inhibiting factors in its implementation. The results are expected to serve as a reference for teachers, inclusive education practitioners, and policymakers in developing more accessible and equitable learning strategies for persons with visual sensory disabilities.

2. Method

This study uses the Research and Development (R&D) method, which aims to develop a learning product and examine its feasibility for use in the learning process. R&D is widely used in media development research because it can produce products that meet students' needs through systematic and continuous stages. According to Efriyanti et al. (2021), the R&D method is used to produce valid, practical, and effective learning media that can optimally support the learning process. In this study, the product developed is classroom miniature media designed to help children with visual impairments understand classroom environmental layouts concretely through tactile experiences.

The development model used in this study is ADDIE, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model is a systematic and flexible instructional design model and is therefore widely used in learning media development. Safitri and Aziz (2022) explain that the ADDIE model supports a structured media development process, from needs analysis to product evaluation. In addition, Adeoye et al. (2024) state that the ADDIE model is effective in instructional development because each stage is interconnected and can produce products that meet students' needs.

During the analysis stage, the researchers conducted a literature review to identify the learning needs of children with visual impairments related to understanding spatial layouts and environmental orientation. The review indicated that children with visual impairments need concrete media based on tactile experiences to help them recognize object positions and directions within the classroom environment. The design stage involved designing the classroom miniature according to the actual learning environment, including determining the media size, object layout, and textures for each object so that they could be easily identified through touch.

Next, during the development stage, the media was produced using materials such as cardboard, styrofoam, textured fabric, paint, and miniature classroom objects. The implementation stage involved testing the media with children with visual impairments during learning activities to observe their responses and ability to understand the classroom layout. The final stage, evaluation, was conducted based on observations and documentation collected during the trial as a basis for improving the media so that it could be used more effectively in environmental orientation learning for children with visual impairments.

3. Results and Discussion

3.1 Results

Based on the research conducted, this study produced learning media in the form of a classroom miniature designed to help children with visual impairments recognize environmental layouts concretely through tactile experiences. The miniature was made using safe and easily tactile materials, such as cardboard, styrofoam, cardstock, textured fabric, paint, and miniature tables and chairs, and was equipped with raised stickers and Braille labels on important components. The use of different textures on each object was intended to enable students to distinguish the shape and position of objects through touch. The classroom miniature consists of several main components: a blackboard, student desks, chairs, a teacher's desk, windows, a door, a cabinet, and walking paths. All components were made in three-dimensional (3D) form to facilitate students with visual impairments in recognizing the shape, size, and position of objects in the classroom. In addition, the media was designed to resemble an actual classroom so that students could obtain a more concrete and understandable representation of the environment.

The media was developed using the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation. During the analysis stage, the researchers identified the learning needs of children with visual impairments regarding their understanding of environmental layouts. The literature review showed that children with visual impairments need tactile learning media to help them understand object positions, directions, and classroom arrangements. According to Branch (2009), the analysis stage is important in media development because it provides the basis for determining students' needs and characteristics. The design stage involved designing the miniature according to the actual classroom conditions. At this stage, the miniature size, object positions, different textures for each object, and Braille label placement were determined so that the components could be easily recognized through touch. The media design was kept simple while still considering accessibility for children with visual impairments.

Next, during the development stage, the miniature was produced using simple materials such as cardboard, styrofoam, textured fabric, and miniature classroom objects. The completed product was then adjusted to make it safer and more comfortable for students with visual impairments. The implementation stage involved testing the media in environmental orientation learning. Students were asked to explore the miniature by touching each component to identify the positions of objects and the arrangement of the classroom. Based on observations, students showed enthusiasm and active participation throughout the learning process. Children with visual impairments appeared to understand the positions of desks, the direction of the door, and the locations of objects in the classroom more easily after using the miniature.

During the evaluation stage, the researchers evaluated the use of the media through observation and documentation. The evaluation results showed that the classroom miniature helped students understand spatial concepts and environmental orientation better than verbal instruction alone. Students also appeared more confident when asked to explain the classroom layout after exploring the miniature.

3.2 Discussion

Hasil penelitian ini menunjukkan bahwa media miniatur ruang kelas efektif digunakan sebagai media pembelajaran bagi anak tunanetra karena memberikan pengalaman belajar yang konkret dan berbasis sentuhan. Anak tunanetra cenderung mengalami kesulitan memahami konsep spasial apabila pembelajaran hanya disampaikan secara verbal. Oleh karena itu, penggunaan media tiga dimensi menjadi solusi yang sesuai dengan karakteristik belajar anak tunanetra yang mengandalkan indera peraba dan pendengaran. Hasil penelitian ini sejalan dengan penelitian Valente, Palama, dan Gentaz (2021) yang menyatakan bahwa model tiga dimensi interaktif efektif membantu anak tunanetra memahami konsep lingkungan dan meningkatkan kemampuan orientasi ruang. Penelitian tersebut menunjukkan bahwa eksplorasi miniatur tiga dimensi melalui sentuhan dapat membantu anak membangun pemahaman spasial secara lebih konkret. Selain itu, penelitian tersebut juga menjelaskan bahwa pengalaman sensorimotor melalui sentuhan mampu meningkatkan kemampuan identifikasi objek dan pemahaman lingkungan pada anak tunanetra.

Another study supporting these findings is Valente et al. (2021) in PLoS ONE on the exploration of three-dimensional miniatures using simulated finger movements. The study explained that this approach can improve spatial understanding and learning experiences among children with visual impairments through an embodied cognition approach. This approach emphasizes that direct experiences through movement and touch help students understand the environment more meaningfully. In addition, the findings are supported by Theurel and Gentaz (2013), who stated that tactile media and three-dimensional models are easier for children with visual impairments to understand than two-dimensional images because they provide direct exploration through touch. Concrete, touch-based media enable children with visual impairments to develop clearer mental representations of the shape and position of objects.

The use of classroom miniature media also supports orientation and mobility learning for children with visual impairments. Orientation and mobility skills are important abilities that help children with visual impairments recognize their surroundings, determine directions, and move independently in daily activities. With classroom miniature media,

students can understand the environmental arrangement before directly interacting with the real setting, thereby increasing their sense of safety and confidence.

Based on the evaluation results, classroom miniature media has several advantages: it is easy to use, engaging for students, supports understanding of spatial layouts, and increases student involvement in learning. However, the media also has limitations, such as its relatively simple miniature size and its limited coverage of the entire school environment. Therefore, further development is needed to make the media more detailed, durable, and suitable for introducing broader school environments. Thus, classroom miniature media can serve as an effective and accessible alternative learning medium for children with visual impairments. Tactile media such as classroom miniatures not only help students understand spatial concepts but also support the fulfillment of equal educational rights for persons with disabilities, particularly children with visual impairments.

4. Conclusion

This article presents a design for developing three-dimensional classroom miniature media specifically designed to help children with visual impairments recognize environmental layouts through concrete tactile experiences. The media design was developed based on the ADDIE model, which consists of five systematic stages: analysis, design, development, implementation, and evaluation. Conceptually, the media is designed using safe and easily tactile materials, such as cardboard, styrofoam, textured fabric, miniature classroom objects, and Braille labels on important components, so that it can be accessed and explored independently by students with visual impairments.

Based on the literature review conducted, tactile miniature media based on three-dimensional models has considerable potential to improve spatial understanding and orientation skills in children with visual impairments. Previous studies have shown that touch-based approaches and direct experiences can help students with visual impairments understand object positions, directions, and spatial arrangements more effectively than verbal methods alone. Based on these findings, this classroom miniature design is expected to provide similar positive impacts when implemented in environmental orientation learning for children with visual impairments. As an initial design, the media still requires further development, expert validation, and field testing before it can be widely used. Further development should consider expanding the scope of the represented environment beyond the classroom to include broader school environments. In addition, the addition of audio features to complement tactile information and the use of more durable materials should be considered so that the media can achieve better quality and long-term usability.

Overall, this classroom miniature media design represents a concrete effort to realize accessible and equitable learning for children with visual impairments. The development of tactile-based media such as this is expected to serve as a useful initial reference for teachers, inclusive education practitioners, and policymakers in designing more innovative and adaptive learning media and strategies. With support from various stakeholders, the media is expected to be implemented and empirically evaluated so that it can make a meaningful contribution to fulfilling equal educational rights for all students with special needs in Indonesia.

References

References are written according to the American Psychological Association (APA) 6th/7th edition style.

Adeoye, M. A., Wirawan, K. A. S. I., Pradnyani, M. S. S., & Septiarini, N. I. (2024). Revolutionizing education: Unleashing the power of the ADDIE model for effective teaching and learning. *Jurnal Pendidikan Indonesia, 13*(1). https://doi.org/10.23887/jpiundiksha.v13i1.68624

Aprilia, W., Satriadi, A., Mablin, R., Qolbi, S., & Andriani, O. (2025). Hak mendapatkan pendidikan bagi anak berkebutuhan khusus dalam dimensi politik hukum pendidikan. *Jurnal Pendidikan Vokasi dan Seni, 3*.

Efriyanti, L., Khomarudin, A. N., & Novita, R. (2021). Pengembangan multimedia berbasis mobile learning dalam pembelajaran model simulasi pada keilmuan komputer. *Jurnal Inovasi Teknologi Pendidikan, 8*(1). https://doi.org/10.21831/jitp.v8i1.42635

Hafidah, N., & Indrawan, R. (2023). Perlindungan hukum anak penyandang disabilitas terkait hak pendidikan. *JALUJUR: Jurnal Pengabdian Masyarakat, 2*. https://doi.org/10.18592/jalujur.v2i2.11543

Mufidah, D. N., Vernanda, G., & Utami, R. T. (2023). Meningkatkan kemampuan membedakan benda di ruang kelas dengan menggunakan media miniatur pada siswa tunarungu kelas 1 di SLB N PKK Provinsi Lampung. *JIIP (Jurnal Ilmiah Ilmu Pendidikan), 6*.

Safitri, M., & Aziz, M. R. (2022). ADDIE, sebuah model untuk pengembangan multimedia learning. *Jurnal Pendidikan Dasar, 3*(2), 51– 59.

Tanjung, I. H., Nasution, H. S., & Barus, J. (2025). Strategi guru menggunakan alat peraga miniatur dalam meningkatkan minat belajar siswa kelas X pada mata pelajaran Fiqh di MAS Al-Washliyah Indrapura. *Jurnal Penelitian dan Pendidikan Agama Islam, 3*.

Theurel, A., Witt, A., Claudet, P., Hatwell, Y., & Gentaz, E. (2013). Tactile picture recognition by early blind children: The effect of illustration technique. *Journal of Experimental Psychology: Applied, 19*(3), 233–240. https://doi.org/10.1037/a0034255

Valente, D., Palama, A., & Gentaz, E. (2021). Exploring 3D miniatures with action simulations by finger gestures: Study of a new embodied design for blind and sighted children. *PLoS ONE, 16*(2), e0245472. https://doi.org/10.1371/journal.pone.0245472