Ceria: Jurnal Program Studi Pendidikan Anak Usia Dini
Volume 14, Number 3, 2025 pages 1236-1255
P-ISSN: 2301-9905 E-ISSN: 2775-409X
Open Access: https://jurnal.umt.ac.id/index.php/ceria/index

Augmented Reality Media for Inclusive Education in Early Childhood

Izza Ikromatus Sa'adah[1], Nursalim[2], Budi Purwoko[3]
[1,2,3] Universitas Negeri Surabaya, Surabaya, Indonesia
e-mail: [1]24011545010@mhs.unesa.ac.id,
[2]mochamadnursalim@unesa.ac.id, [3]budi purwoko@unesa.ac.id

ARTICLE INFO

Article history:
Received: May 30, 2025
Accepted: October 11, 2025
Available online on:
October 31, 2025

Keywords:
Augmented Reality; Inclusive; Early Childhood; Learning Media

ABSTRACT

This article discusses the role of Augmented Reality (AR) media in supporting the implementation of inclusive education for early childhood. Through a literature study approach, this research examines various relevant sources regarding the use of Augmented Reality (AR) technology, principles of early childhood learning, and the concept of inclusive education. The findings show that the use of AR in the learning process can increase children's motivation, attention, and engagement through interactive, visual, and contextual learning experiences. AR provides opportunities for children to learn more meaningfully by presenting three-dimensional objects that appear real, making it easier to understand abstract concepts. Additionally, this technology plays an essential role in supporting children with special needs, such as autistic children, by providing flexible, adaptive, and easily adjustable learning media based on individual abilities. However, implementing AR in inclusive education still faces various challenges, including limited digital infrastructure, low technological

competence among educators, and the lack of local content suitable for Indonesian children. Therefore, collaboration among the government, technology developers, and education practitioners is crucial for creating AR media that is inclusive, child-friendly, and oriented toward educational equity. Overall, AR has great potential as a bridge toward an equal and just education system for all early childhood learners.

Introduction

Education is a fundamental right possessed by every child regardless of background, physical, intellectual, social, or emotional conditions. Young children need preparation from their parents in the form of education, as it serves as an important basis for living a meaningful life. Parents may provide this education directly or through educational institutions such as early childhood education (PAUD) (Elan et al., 2023). In recent years, perspectives on education have shifted from an exclusive system to an inclusive approach, one that accommodates various types of learners. Inclusive education aims not only to include children with special needs in regular schools but also to ensure that every child receives the support needed to grow and develop (UNESCO, 2021). In early childhood, inclusive approaches are crucial as this is a period when learning abilities, social skills, and emotional maturity begin to develop. However, implementing inclusive education at the PAUD level often faces challenges such as a lack of trained educators and limited learning facilities tailored to children with

special needs.

Learning media in education can generally be described as tools or resources used to deliver messages or learning materials effectively, with the primary goal of attracting children's attention, emotions, focus, and abilities so that they can actively participate in teacher-guided learning (Suryani et al., 2024). Needs in the educational sector continue to evolve alongside developments in various fields, including technological advancements (Widhiasih & Yunita, 2021).

In today's rapidly developing digital age, educational technology (edtech) provides significant opportunities to overcome many challenges. One technological innovation currently growing in education is Augmented Reality (AR). AR is a technology that combines virtual objects with the real world simultaneously, creating a more contextual and immersive learning experience. With AR, children can interact directly with 3D visuals, sounds, and animations, making learning more engaging and easier to understand—especially for visual and kinesthetic learners (Akçayır & Gökçe, 2017). This technology is considered highly effective in supporting the Universal Design for Learning (UDL), which promotes flexible and accessible learning for all children regardless of their abilities.

In the context of inclusive education for early childhood, AR-based media can bridge children's unique needs with learning materials. For example, children with speech delays can benefit from AR media that provides visuals and audio to explain word meanings, while children

with motor challenges can engage using simple movements. Antonioli et al. found that AR can increase active participation, motivation, and conceptual understanding among children with special needs and support social skill development through interactive, collaborative activities (Antonioli et al., 2014).

Despite these benefits, AR use in inclusive education still faces challenges, such as limited hardware, inadequate teacher training, and restricted access to digital infrastructure in many regions. Thus, collaboration among the government, technology developers, educators, and communities is necessary to create child-friendly AR solutions aligned with inclusive early childhood curricula. With the right approach, AR can serve not only as a learning aid but also as a bridge toward a more equitable, adaptive, and empowering education system for all children.

Methods

This research uses a literature study method, which is a research approach focused on in-depth analysis of various written sources such as scientific journals, books, articles, and other documents relevant to the research topic. According to Nazir (2014), literature study is the process of collecting data or information using library sources without conducting direct field research. This method is valuable for understanding theoretical foundations, previous findings, and remaining research gaps within a particular discipline.

In the context of the article "Augmented Reality Media for Inclusive

Education in Early Childhood," literature study is crucial for exploring fundamental concepts related to AR technology, early childhood education (PAUD), and inclusive education approaches. Constructivist theories by Piaget and Vygotsky, which emphasize the importance of interaction and exploration in learning, can serve as the theoretical foundation for developing AR-based learning media. The inclusive education framework by UNESCO highlights the importance of equal access and participation for all children, including those with special needs. By analyzing literature discussing AR implementation and challenges within inclusive PAUD settings, researchers can construct strong scientific arguments regarding the potential, effectiveness, and limitations of AR in supporting adaptive, interactive, and inclusive learning for all learners.

Result and Discussions

By reviewing various literature discussing the application of Augmented Reality (AR) in education and the challenges faced in inclusive early childhood education, the researcher was able to formulate strong scientific arguments regarding the potential, effectiveness, and limitations of AR in supporting adaptive, interactive, and inclusive learning for all learners.

Below is the literature review table that has been mapped based on the application of AR for early childhood:

Author	Title	Source	Researc	Theme	Findin	Signific

(s)			h Objecti ve		gs	ance
Akçayı r, M., & Gökçe, A. (2017)	Advan tages and Challe nges Associ ated with Augme nted Reality for Educat ion: A System atic Revie w of the Literat ure	Educati onal Researc h Review , 20, 1–11	To review the advanta ges and challen ges of AR use in educati on	AR technol ogy in educati on	AR increas es student motivat ion and compre hension but require s teacher readine ss and infrastr ucture	Provide s a theoreti cal foundat ion on benefits and challen ges of AR implem entation

Antonioli, M., Blake, C., & Sparks, K. (2014)	Augmented Reality Applications in Education	Journal of Technology Study, 40(2)	To examine the use of AR across educational levels and its impact on student engagement	AR implementation in learning	AR strengthens learning interaction and helps students with special needs	Relevant for inclusive early childhood contexts
Deiner, P. (2012)	Inclusive Early Childhood Education: Development, Resour	Thomson Learning	To discuss inclusive early childhood education practices	Inclusive education	Inclusive education requires flexible approaches and	Serves as a theoretical basis for inclusive education

	ces, and Practice				adaptive learning resources	
Chin, K.-Y., Wang, C.-S., & Chen, Y.-L. (2018)	Effects of an AR-Based Mobile System on Students' Learning Achievements and Motivation for a Liberal Arts	Interactive Learning Environments, 27(7), 927–941	To assess the impact of AR on learning outcomes and motivation	AR and learning motivation	AR enhances learning outcomes and student engagement	Demonstrates AR effectiveness in improving motivation and understanding

	Course					
Huang, Y., Li, H., & Fong, R. (2016)	Using Augmented Reality in Early Art Education: A Case Study in Hong Kong Kindergarten	Early Child Development and Care, 186(6)	To evaluate AR use in early childhood learning	AR for early childhood	Children show increased focus and engagement when using AR	Demonstrates AR potential in visual learning for young children
Aydoğdu, F. (2021)	Augmented Reality for Preschool Childr	British Journal of Educational Technology	To investigate preschool children's	AR for preschoolers	Children demonstrate increased focus	Shows AR's effectiveness in early cognitive

	en: An Experience with Educational Contents		experience with AR educational content		and exploration when using AR	development
Elan, G., Gandana, G., & Fauziah, D. E. (2023)	*Analisis Penggunaan Flashcard Berbasis Digital untuk Meningkatkan Kemampuan Bahasa Reseptif Anak*	Jurnal Ceria, 12(1)	To analyze the effectiveness of digital media on children's language skills	Digital media & childhood language	Digital media improves children's receptive language	Supports the use of digital media in early childhood learning

	Usia Dini					
Suryani et al. (2024)	*Artificial Intelligence sebagai Media Pembelajaran untuk Anak Usia Dini*	Jurnal Ceria, 13(3)	To develop AI as learning media for early childhood	Digital technology in early childhood	AI increases childrenʼs participation in interactive learning	Reinforces the shift toward intelligent technology in early education
Widhiasih, A. P., & Yunita, S. (2021)	*Pengembangan Permainan Interaktif Berbasis Teknologi*	Jurnal Ceria, 10(1)	To develop technology–based educational games for early	Technology-based educational games	Interactive games help children learn basic concepts in enjoyab	Strengthens the importance of interactive media as early childhood

	untuk Anak Usia Dini		childhood		le ways	learning strategies
UNESCO (2020)	Inclusive Education: Children with Disabilities	UNESCO Publication	To explain principles and global implementation of inclusive education	Inclusive education	Emphasizes equal access and participation for all children	Serves as policy and theoretical foundation for inclusive education
Pan, Z., López, M. F., Li, C., & Liu, M. (2021)	Introducing Augmented Reality in Early Childh	Research in Learning Technology	To introduce AR in literacy learning for young childre	AR & early literacy	AR helps children understand visual concept	Relevant for literacy and critical thinking develop

	ood Literacy Learning		n		s and increases reading interest	ment
Nasution, N., Darmayunata, Y., & Wahyuni, S. (2022)	*Pengembangan Media Pembelajaran Anak Usia Dini berbasis Augmented Reality*	Jurnal Obsesi, 6(5)	To investigate AR-based media development in early childhood	Digital learning innovation	AR effectively increases learning engagement and understanding of basic concepts	Confirms AR relevance within the Indonesian early childhood context
Kencanawati, I. (2024)	*Pengaruh Media Pembel*	NANA EKE: Indonesian	To determine the effect of	AR for early childhood /	AR group showed signific	Demonstrates AR ability

	ajaran Berbasis Augmented Reality terhadap Kemampuan Berpikir Simbolik Anak Usia 5-6 Tahun	Journal of Early Childhood Education, 7(2)	AR media on symbolic thinking	symbolic cognition	ant improvement compared to control	to enhance symbolic thinking
Siswono, H., Zahro, I., & Cahyono, A. E. (2024)	Development of an Augmented Reality Book Based	Jurnal Kependidikan, 10(4)	To develop an AR-based inquiry science book for young	AR & early science learning	AR book was successfully developed and	Provides a concrete example of AR supporting

	on Science Inquiry for Early Childhood		children		shows potential for science literacy	science literacy
Sari, R., Rahma, R., & Basri, N. (2024)	Improving Early Childhood Literacy Abilities Through Digital 3D With Augmented Reality Techno	Catharsis, 13(2)	To examine 3D AR digital media for improving literacy	AR & early literacy	3D AR effectively improves literacy and engagement	Strengthens AR's role in literacy development

	logy					
Irmade, O., Widjanarko, P., & Andaryani, E. T. (2022)	Augmented Reality as Early Childhood Learning Media: Environment Theme	Jurnal Edukasi, 16(1)	To develop AR-based learning media with environmental themes	AR & environmental learning	Expert validation rated AR media highly; children responded positively	Demonstrates AR's feasibility in early environmental education

Based on the analysis of various literature, Augmented Reality (AR) provides significant contributions in supporting the implementation of inclusive education for young children. In inclusive learning environments, variations in children's abilities, needs, and learning styles become major challenges for early childhood educators. AR emerges as a technological solution capable of bridging these differences by delivering learning material that is more interactive, multimodal, and accessible to all students, including those with special needs.

One important benefit of AR in inclusive learning is its ability to

increase children's motivation and attention. Research by Murat and Ökçe shows that AR can create a more engaging learning atmosphere through 3D object visualization and interactive simulations, which substantially increase children's concentration and engagement. This is highly relevant for early childhood, where learning relies heavily on direct, visual, and kinesthetic experiences.

For children with special needs—such as autism, ADHD, or dyslexia—AR media provides alternative modes of information delivery aligned with their learning characteristics. By combining sound, images, movement, and interactivity tailored to individual needs, AR helps reduce learning anxiety and increases understanding. Applications designed specifically for autistic children allow them to learn in safe, non-threatening environments with immediate feedback.

In inclusive classroom settings, AR is also effective in encouraging active participation from all children, both those with and without special needs. Research by Huang et al. (2016) indicates that AR-based learning promotes collaboration, discussion, and exploration accessible to all children, strengthening inclusive education principles focused on equal participation.

Additionally, AR serves as a useful formative assessment tool. Teachers can observe how children interact with AR objects, complete simulation-based tasks, and respond to learning stimuli, enabling them to gather detailed and authentic information about learning progress.

Despite the benefits, several challenges remain, including limited

technological infrastructure, insufficient teacher digital skills, and a lack of Indonesian AR content aligned with the PAUD curriculum. Addressing these issues requires teacher training, local content development, and collaboration among technology developers, inclusive education experts, and early childhood practitioners.

Overall, AR has immense potential to enrich inclusive early childhood learning by offering engaging visuals, interactivity, and customizable features. Although challenges persist, AR development shows positive progress, especially with supportive policies and child-friendly technological innovations.

Conclusion

Augmented Reality (AR) has significant potential to support inclusive education in early childhood by providing interactive, engaging, and developmentally appropriate learning experiences. AR helps increase attention and participation and enables flexible learning for children with diverse needs, including children with special needs. However, its implementation still faces challenges such as limited devices, low teacher digital literacy, and the lack of relevant AR materials. Collaboration among the government, developers, schools, and the community is needed to provide training, develop technology-based curricula, and improve infrastructure. When implemented effectively, AR has the potential to transform inclusive education to become more equitable, personalized, and child-centered.

References

Akçayır, M., & Gökçe, A. (2017). Advantages and challenges associated with augmented reality for education: A systematic review of the literature. *Educational Research Review*, *20*, 1–11. https://doi.org/https://doi.org/10.1016/j.edurev.2016.11.002

Antonioli, M., Blake, C., & Sparks, K. (2014). Augmented Reality Applications in Education. *Journal of Technology Study*, *40 (2)*. http://www.jstor.org/stable/43604312

Aydoğdu, F. (2021). Augmented reality for preschool children: An experience with educational contents. *British Journal of Educational Technology*. https://doi.org/https://doi.org/10.1111/bjet.13168

Chin, K.-Y., Wang, C.-S., & Chen, Y.-L. (2018). Effects of an augmented reality-based mobile system on students' learnig achievements and motivation for a liberal arts course. *Interactive Learning Environments*, *27 (7)*, 927–941. https://doi.org/https://doi.org/10.1080/10494820.2018.1504308

Elan, Gandana, G., & Fauziah, D. E. (2023). Analisis Penggunaan Flashcard Berbasis Digital untuk Meningkatkan Kemampuan Bahasa Reseptif Anak Usia Dini. *Jurnal Ceria*, *12*(1). https://doi.org/http://dx.doi.org/10.31000/ceria.v12i1

Huang, Y., Li, H., & Fong, R. (2016). Using Augmented Reality in early art education: a case study in Hong Kong kindergarten. *Early Child Development and Care*, *186*(6). https://doi.org/https://doi.org/10.1080/03004430.2015.1067888

Irmade, O., Widjanarko, P., & Andaryani, E. T. (2022). *Augmented Reality as Early Childhood Learning Media: Environment Theme*. 12–19.

Kencanawati, I. (2024). Pengaruh Media Pembelajaran Berbasis Augmented Reality terhadap Kemampuan Berpikir Simbolik Anak Usia 5-6 Tahun. *Jurnal Universitas Negeri Makasar*.

Murat, & Ökçe. (2017). Advantages and challenges associated with augmented reality for education: A systematic review of the literature. *Educational Research Review*, *20*, 1–11. https://doi.org/https://doi.org/10.1016/j.edurev.2016.11.002

Nasution, N., Darmayunata, Y., & Wahyuni, S. (2022). Pengembangan Media Pembelajaran Anak Usia Dini berbasis Augmented Reality. *Obsesi : Jurnal Pendidikan Anak Usia DIni*, *6*(6), 6462–6468.

https://doi.org/10.31004/obsesi.v6i6.3408

Pan, Z., López, M. F., Li, C., & Liu., M. (2021). Introducing augmented reality in early childhood literacy learning. *Research in Learning Technology*, *29*. https://doi.org/https://doi.org/10.25304/rlt.v29.2539

Sari, R., Rahma, R., & Basri, N. (2024). *Improving Early Childhood Literacy Abilities Through Digital 3d With Augmented Reality Technology*. 165–172.

Siswono, H., Zahro, L., & Cahyono, A. E. (2024). Development of an Augmented Reality Book Based on Science Inquiry for Early Childhood. *Jurnal Kependidikan*, *10*(4).

Suryani, A., Loliyana, Rohman, F., Sowiyah, Sugianto, & Khomsiyati, S. (2024). Artificial Intelligence sebagai Media Pembelajaran untuk Anak Usia Dini. *Jurnak Ceria*, *13*(3). https://doi.org/http://dx.doi.org/10.31000/ceria.v13i3.12176

UNESCO. (2020). *Inclusive education: children with disabilities*. UNESCO.

Widhiasih, A. P., & Yunita, S. (2021). Pengembangan Permainan Interaktif Berbasis Teknologi Untuk Anak Usia Dini. *Jurnal Ceria*, *10*(1).