KARYA ILHAM PUBLISHING
CONNECTING MINDS, BRIDGING IDEAS, INSPIRING READERS

Journal of Advanced Research in Social and Behavioural Sciences

Journal homepage:
https://karyailham.com.my/index.php/jarsbs/index
ISSN: 2462-1951

Advancing Inclusive Early Childhood Pedagogy Through Human-Centered Artificial Intelligence: A Conceptual Framework For Supporting Children With Special Education Needs

Nurmuma Kamarina Jamil[1], Zaheril Zainudin[2,*], Hasnah Embi[3]

[1] Faculty of Education and Liberal Studies, City University of Malaysia, No. 8, Jalan 51A/223, Seksyen 51A, 46100 Petaling Jaya, Selangor, Malaysia
[2] Faculty of Education and Liberal Studies, INTI International University, Persiaran Perdana BBN, Putra Nilai, Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan, Malaysia
[3] Tadika Sri Comel Manja, No 1, Jalan Ara SD 7/4, Bandar Sri Damansara, 52200 Kuala Lumpur, Malaysia

ARTICLE INFO

Article history:
Received 19 May 2026
Received in revised form 7 June 2026
Accepted 8 June 2026
Available online 20 June 2026

Keywords:
Artificial intelligence (AI), inclusive pedagogy; early childhood education (ECE), special educational needs (SEN), human-centered AI

ABSTRACT

The integration of artificial intelligence (AI) in early childhood education (ECE) presents new opportunities for enhancing inclusive pedagogy, particularly for children with special educational needs (SEN). However, existing approaches often prioritize technological efficiency over developmental, pedagogical and ethical considerations. This study proposes a human-centered AI framework for inclusive ECE pedagogy that positions AI as a supportive, teacher-mediated tool rather than a replacement for human interaction. Drawing on Inclusive Education Theory, Universal Design for Learning, Human-Centered AI, Child Development Theory, Sociocultural Theory and Assistive Technology Theory, the study develops a conceptual model linking human-centered principles, AI technologies, inclusive pedagogy, teacher mediation, developmental needs, SEN support and learning outcomes. The framework highlights that effective AI integration depends on alignment with human values, teacher expertise, and developmental appropriateness. This study contributes theoretically by offering a comprehensive model to guide research, policy and practice in responsible AI implementation in inclusive ECE.

1. Introduction

The rapid advancement of artificial intelligence (AI) has reshaped education across all levels, including early childhood education (ECE), where digital tools, adaptive technologies, and intelligent systems are increasingly used to support teaching and learning [16, 24]. AI applications such as personalized learning platforms, speech recognition, predictive analytics, and assistive technologies have shown potential to enhance teaching effectiveness and support diverse learners [49, 50]. In ECE, these tools may assist teachers in providing individualized instruction, monitoring developmental progress, and creating inclusive environments that respond to children's varied needs [29, 45].

* *Corresponding author.*
E-mail address: zaheril.zainudin@newinti.edu.my

https://doi.org/10.37934/arsbs.43.1.270280

However, the integration of AI also raises pedagogical, ethical, and developmental concerns, particularly for young children with special education needs (SEN), who require responsive, human-centered, and developmentally appropriate instruction [15, 17].

Inclusive education is a global priority that emphasizes equal participation for all children, regardless of ability, disability, or developmental differences [3, 45]. In ECE, inclusive pedagogy is especially important because children are developing rapidly across cognitive, social, emotional, and language domains [34, 9]. Children with SEN, including those with autism spectrum disorder, speech and language delays, sensory impairments, learning disabilities, or developmental disorders, often require individualized strategies, continuous teacher guidance, and emotionally responsive interactions [2, 12]. Yet, many ECE teachers face challenges in implementing inclusive practices due to limited training, insufficient resources, large class sizes, and lack of specialized support [13, 19].

AI has been proposed as a promising support mechanism for addressing these challenges through adaptive instruction, real-time feedback, and assistive learning tools [17, 6]. AI-powered systems can help teachers monitor progress, adjust learning activities, and provide alternative representations of content based on children's needs [24, 16]. For example, text-to-speech tools may support children with reading difficulties, visual recognition systems may assist learners with communication challenges, and adaptive platforms may personalize learning pace [50, 29]. In special education, AI-based assistive technology can improve accessibility and participation in inclusive classrooms [29, 44].

Nevertheless, AI in ECE and SEN should not be treated as a purely technological solution. Young children learn through play, social interaction, emotional connection, and guided participation, which cannot be fully replaced by automated systems [11, 43]. Overreliance on AI may weaken teacher–child relationships and reduce meaningful interaction. AI may also create ethical risks, including bias, privacy concerns, and unequal access, especially for vulnerable learners [15, 44].

Therefore, a human-centered AI framework is needed to guide inclusive ECE pedagogy. Human-centered AI emphasizes that technology should support human values, ethical principles, and pedagogical goals rather than replace human roles [15, 40]. Teachers must remain central as mediators who interpret children's needs, guide learning, and ensure that AI supports well-being, participation, and equity [46, 14]. This paper proposes a conceptual framework integrating human-centered AI, inclusive pedagogy, child development theory, and Universal Design for Learning to support children with SEN. The framework offers theoretical guidance for researchers, educators, and policymakers seeking to implement AI responsibly while preserving the relational, developmental, and ethical foundations of ECE.

2. Literature Review

2.1 Inclusive Pedagogy In Early Childhood Education

Inclusive pedagogy is a central principle in early childhood education (ECE), reflecting global commitments to equitable learning for all children regardless of ability, disability, or developmental differences [38, 45]. It views diversity as a natural feature of learning environments and requires teaching practices that support all learners within shared classrooms rather than separating children with SEN [4, 22]. In ECE, this is especially important because young children undergo rapid cognitive, social, emotional, and language development [39]. Children with SEN may require individualized instruction, differentiated materials, and continuous teacher guidance to participate meaningfully [42, 20, 18]. However, teachers often face limited training, support, and resources [13]. UDL supports inclusion through multiple means of representation, engagement, and expression [48, 36].

2.2 AI in Education and Special Education

AI has become a powerful tool for teaching and learning through adaptive instruction, intelligent tutoring systems, and data-driven decision making [16, 24]. By analysing learner behaviour, providing real-time feedback, and personalizing content, AI is relevant to inclusive education, where learners have diverse abilities and learning styles [50]. In ECE, AI tools can monitor developmental progress, support language learning, and create interactive learning experiences [23]. In SEN contexts, AI functions as assistive technology through speech-to-text applications, visual recognition systems, and adaptive platforms that adjust task difficulty [7]. Learning analytics also help teachers identify difficulties early and design responsive interventions [21]. However, AI use in ECE must remain cautious because young children learn through play, relationships, and social interaction, while AI may raise concerns about overreliance, bias, privacy, and unequal access [11, 35, 15, 45].

2.3 Human-Centered AI in Education

Human-centered AI ensures that technology supports human values, ethical principles, and social needs [40, 15]. In education, it emphasizes that AI should enhance teaching and learning without replacing teachers or reducing meaningful human interaction [17]. This is especially important in ECE, where learning depends on emotional support, social engagement, and guided participation [25]. A human-centered approach keeps teachers central as mediators who interpret children's needs and decide how AI should support learning [24]. Rather than replacing educators, AI should help adapt instruction, monitor progress, and provide individualized guidance [17]. In inclusive classrooms, this supports accessibility while maintaining responsiveness to children with SEN. Ethical AI must also promote fairness, transparency, learner rights, developmental appropriateness, cultural sensitivity, and pedagogical alignment [15, 45].

2.4 Research Gap and Demand for a Conceptual Framework

Although AI in education has expanded rapidly, most studies focus on higher education or general schooling, with limited attention to ECE [50]. Research on inclusive ECE pedagogy also rarely explains how emerging technologies can support children with SEN in developmentally appropriate ways [13]. Existing AI studies often emphasize technical functions while overlooking pedagogical theory, teacher mediation, and ethical implications. Consequently, no comprehensive framework currently integrates human-centered AI, inclusive pedagogy, and early childhood special education. This study addresses the gap by proposing a human-centered AI framework to guide responsible, inclusive, and developmentally appropriate AI use for children with SEN.

3. Theoretical Foundations

The development of a human-centered AI framework for inclusive ECE pedagogy requires a strong theoretical foundation that integrates perspectives from inclusive education, learning sciences, developmental psychology, human-centered technology and assistive technology. Teaching young children with SEN involves complex interactions between developmental readiness, social engagement, instructional adaptation and technological support. Therefore, no single theory is sufficient to explain how AI might be effectively used in inclusive ECE classrooms. This study draws on Inclusive Education Theory, Universal Design for Learning (UDL), Human-Centered Artificial

Intelligence Theory, Child Development Theory, Sociocultural Theory and Assistive Technology Theory to provide a comprehensive foundation for the proposed conceptual framework.

3.1 Inclusive Education Theory

Inclusive Education Theory provides a foundation for designing teaching that accommodates diverse learners within shared environments. It emphasizes that all children, regardless of ability, have the right to participate in meaningful learning, requiring systems to adapt to learner diversity rather than the reverse [45, 37, 5]. In ECE, inclusive pedagogy involves flexible strategies, differentiated instruction, and supportive environments enabling children with special educational needs to learn alongside peers [10]. Teachers play a central role in interpreting needs and facilitating participation. While AI can support personalization, inclusive education remains fundamentally human-centered, relying on relationships, empathy, and professional judgment [26].

3.2 Universal Design for Learning (UDL)

Universal Design for Learning (UDL) extends inclusive education by offering a framework for designing accessible learning environments from the outset [48]. It is based on three principles: multiple means of representation, engagement, and expression, enabling flexible teaching and diverse communication [36]. In ECE, UDL supports play-based and differentiated learning suited to varied developmental needs [27]. AI might enhance UDL by enabling adaptive content, multimodal support, and personalized feedback [16]. However, technology must remain aligned with pedagogical goals, ensuring a human-centered and developmentally appropriate approach.

3.3 Human-Centered AI Theory

Human-centered AI provides the ethical and technological basis for integrating AI into education by emphasizing support for human capabilities, decision-making, and well-being rather than replacing human roles [40, 15]. In ECE, this approach is crucial as young children rely on social interaction, play, and guided learning [23]. Misuse of AI may reduce meaningful engagement and harm development. It also addresses risks such as bias, privacy and fairness, especially for children with SEN [44]. Thus, teachers must remain central, ensuring AI supports inclusive, developmentally appropriate pedagogy.

3.4 Child Development Theory

Child Development Theory explains how young children learn through exploration, social interaction, and gradual cognitive growth [31, 32, 33, 47]. Children with special educational needs may follow different developmental pathways, requiring individualized support and carefully designed learning experiences. Developmentally appropriate practice ensures teaching aligns with children's age, abilities, and context [30]. While AI might assist in monitoring progress and adapting instruction, teaching decisions must remain guided by professional knowledge. This highlights the importance of teacher mediation to ensure AI supports holistic development, including cognitive, social and emotional growth.

3.5 Sociocultural Theory

Sociocultural theory, developed by Vygotsky [47], explains that learning occurs through social interaction and guided participation within meaningful contexts. Children develop knowledge through communication with more knowledgeable others, with the Zone of Proximal Development (ZPD) highlighting the importance of appropriate support. In inclusive early childhood classrooms, collaboration, dialogue, and teacher guidance are essential, especially for children with SEN who benefit from scaffolded instruction [41]. While AI might provide adaptive support, it cannot replace social interaction. A human-centered AI approach ensures technology supports, rather than replaces, teacher-guided learning within social contexts.

3.6 Assistive Technology Theory

Assistive Technology Theory explains how tools can support individuals with disabilities by improving access to learning and participation [21]. In education, assistive technologies include communication devices, adaptive software, and sensory supports that help learners overcome barriers [28]. AI enhances these tools by enabling more personalized and responsive support. In early childhood special education, such technologies assist communication, understanding, and engagement [8]. However, effective use requires teacher knowledge and alignment with pedagogical goals [1]. Thus, AI should function as a supportive tool within inclusive pedagogy, guided by teachers who understand both technology and child development.

3.7 Integration of Theoretical Foundations

The theories discussed provide complementary perspectives forming the foundation of the proposed framework. Inclusive Education Theory emphasizes equitable participation, Universal Design for Learning supports flexible instruction, Human-Centered AI ensures ethical technology use, Child Development Theory guides age-appropriate practice, Sociocultural Theory highlights interaction and Assistive Technology Theory supports learners with SEN. Integrating these perspectives, the study proposes that AI should be applied within a human-centered pedagogical approach where teachers remain central and learning environments stay inclusive. Technology functions as a supportive tool for adaptive instruction, ensuring developmentally appropriate, inclusive, and effective teaching for children with SEN.

4. Conceptual Framework Development

The proposed conceptual framework explains how human-centered AI can support inclusive early childhood education (ECE) pedagogy for children with special educational needs (SEN). It addresses a key literature gap by offering conceptual guidance on how AI may be integrated into ECE in ways that are inclusive, developmentally appropriate, and ethically grounded. The model positions AI not as an independent instructional force, but as a teacher-mediated pedagogical support system shaped by dignity, inclusion, fairness, well-being, and equity.

The framework begins with human-centered principles that guide ethical AI use and ensure technology supports participation, teacher judgment, and relational learning. These principles inform the use of adaptive AI tools, including speech systems, learning analytics, assistive technologies, and personalized platforms. AI then strengthens inclusive pedagogy by supporting multiple representations, engagement, accessibility, and individualized learning.

Teacher mediation is central since teachers select, interpret, and adapt AI tools according to children's developmental needs and SEN support requirements. This ensures that AI remains responsive, inclusive, and context-sensitive rather than replacing human interaction. Ultimately, the framework proposes that when human-centered values, AI technologies, inclusive pedagogy, teacher mediation, developmental appropriateness, and SEN support are aligned, they can enhance engagement, communication, independence, emotional well-being, and holistic learning outcomes.

5. The Proposed Conceptual Model

To operationalize the theoretical assumptions, this study proposes a conceptual model of Human-Centered Artificial Intelligence for Inclusive Early Childhood Pedagogy. The model explains how AI can be integrated into ECE classrooms while remaining aligned with inclusive education, developmental appropriateness, and teachers' professional roles. It positions human-centered values as the foundation, AI as a supportive tool, and teacher mediation as the mechanism for implementing inclusive pedagogy for children with SEN. The model links human-centered principles, AI technologies, inclusive pedagogy, teacher mediation, child development needs, SEN support, and learning outcomes, offering guidance for researchers, teachers, and policymakers. The model is illustrated in **Figure 1**.

Figure 1 illustrates a conceptual model in which human-centered principles form the foundation for integrating AI into inclusive early childhood education. These principles—child dignity, inclusion, ethical responsibility, developmental appropriateness, participation, and emotional well-being—ensure that AI is adopted not merely for efficiency, but to support children's needs and preserve the relational nature of ECE. Guided by these values, AI technologies such as adaptive learning systems, speech recognition tools, communication applications, learning analytics, intelligent tutoring, and multimodal platforms function as supportive resources rather than teacher replacements.

The model positions inclusive pedagogy as the central instructional domain where AI enhances flexibility, accessibility, differentiated instruction, and personalized feedback. However, meaningful implementation depends on teacher mediation. Teachers select, interpret, and adapt AI tools according to classroom realities, children's behaviour, developmental readiness, and SEN-related needs. Child development needs act as a filter to ensure AI remains age-appropriate and does not disrupt play, interaction, or exploration. SEN support involves individualized instruction, communication assistance, sensory accommodation, behavioural guidance, and accessible materials while maintaining shared classroom participation.

Eventually, effective alignment among human-centered values, AI, inclusive pedagogy, teacher mediation, developmental needs, and SEN support leads to improved learning outcomes, including engagement, communication, independence, emotional well-being, participation, and holistic development.

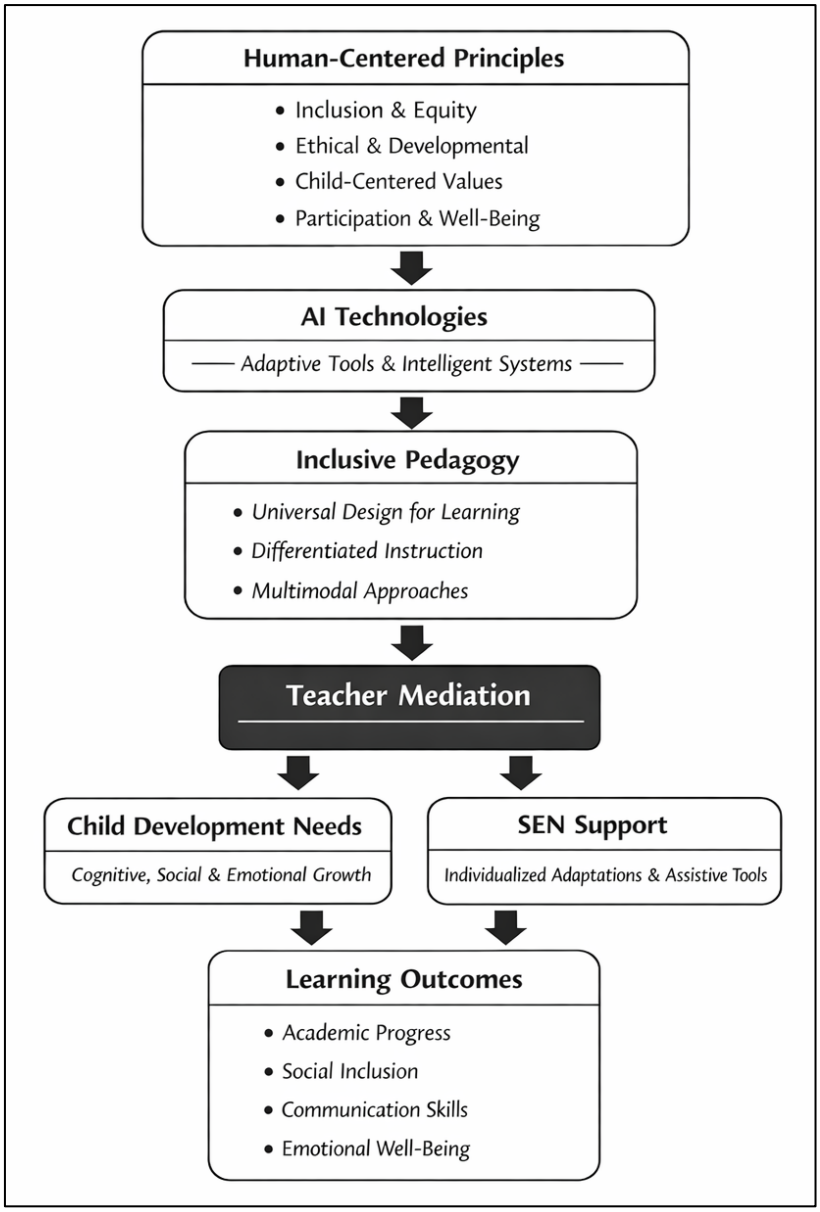

Fig. 1. Human-Centered Artificial Intelligence Framework for Inclusive Early Childhood Pedagogy for Children with SEN

6. Implications For Practice And Policy

The proposed human-centered AI framework has significant implications for practice and policy in inclusive early childhood education (ECE), particularly for children with SEN. As AI becomes embedded in teaching, its use must remain aligned with inclusive pedagogy, developmental appropriateness, and ethical responsibility. The framework calls for collaboration among ECE teachers, SEN teachers, curriculum developers, and policymakers to ensure AI enhances inclusion rather than reinforces inequality.

A key implication is teacher training. Educators need preparation not only in digital tool use but also in applying AI to inclusive pedagogy, as many teachers remain unprepared to integrate

technology for diverse learners [3]. Professional development should cover human-centered AI, child development, assistive technologies, teacher mediation, privacy, bias, and responsible data use [17]. The framework also supports ethical guidelines and curriculum reform. Policymakers should establish standards ensuring AI tools are transparent, accessible, fair, developmentally appropriate, and supportive of teacher decision-making [45]. Curriculum developers may integrate AI into play-based learning, communication activities, and assessment through Universal Design for Learning principles [36]. Inclusive policies should also address emerging technologies more clearly [13]. Overall, AI should strengthen individualized support and participation without replacing human interaction.

7. Contributions To Theory

This study contributes theoretically by proposing an integrated human-centered framework linking AI, inclusive pedagogy and ECE. It addresses gaps by showing how AI supports differentiated instruction, accessibility and participation while maintaining developmental appropriateness and ethical practice. The framework extends Universal Design for Learning through adaptive, multimodal and personalized AI-supported instruction. It also advances human-centered AI by emphasizing teacher mediation and preserving relational learning. Additionally, it offers a SEN-focused model that integrates assistive technology with inclusive pedagogy to support diverse learners. By synthesizing Inclusive Education, UDL, Human-Centered AI, Child Development, Sociocultural, and Assistive Technology theories, the study provides a comprehensive foundation. This integration offers a coherent model to guide future research, curriculum design and policy development.

8. Future Research Directions

Future research is needed to empirically validate and refine the proposed human-centered AI framework in inclusive ECE pedagogy. Quantitative studies using structural equation modeling can test relationships among AI use, teacher mediation, inclusive pedagogy and learning outcomes. Teacher-focused qualitative studies should explore educators' perceptions, readiness and challenges. Classroom-based experiments can assess the effectiveness of AI-supported inclusive practices on participation and development. Cross-cultural studies are also important to examine contextual differences in implementation. Additionally, scale development is needed to measure key constructs such as teacher mediation and developmental appropriateness. Mixed-method approaches are recommended to capture the complexity of ECE. Finally, future research should prioritize empirical validation, teacher perspectives, and practical classroom applications.

9. Conclusion

This study proposed a human-centered AI framework for inclusive ECE pedagogy to support the teaching and learning of children with SEN. The framework integrates Inclusive Education Theory, Universal Design for Learning, Human-Centered AI, Child Development Theory, Sociocultural Theory, and Assistive Technology Theory to explain how AI can be used in ways that remain developmentally appropriate, ethically responsible and pedagogically meaningful. The model emphasizes that human-centered principles should guide the use of AI, while teacher mediation plays a central role in adapting technology to support inclusive pedagogy and individual learning needs. By positioning artificial intelligence as a supportive tool rather than a replacement for teachers, the framework highlights the importance of balancing technological innovation with the relational and developmental nature of ECE. The proposed model contributes to theory by providing an integrated

perspective that connects AI, inclusion, and early childhood pedagogy and offers a foundation for future empirical research and responsible implementation in inclusive educational settings.

References

[1] Abdelwahab, M. M., K. A. Al-Karawi, and H. E. Semary. "A Systematic Review of Assistive Technology for Enhancing the Students with Disabilities." *Journal of Disability Research* 4, no. 2 (2025): 1-12. https://doi.org/10.57197/JDR-2024-0117.

[2] Abeykoon, H. N. "Challenges Faced by Educators in Supporting Children with Special Educational Needs and Disabilities in England." *International Journal of Education and Research* 12, no. 12 (2024): 63-84. https://ijern.com/journal/2024/December-2024/06.pdf.

[3] Afriani, G. "The Role of Teachers in Implementing Inclusive Education for Children with Special Needs in General School Environments." *Global Education Journal* 3, no. 2 (2025): 575-583. https://doi.org/10.59525/gej.v3i2.751.

[4] Akbar, K., H. Syahmahita, J. Damanik, F. Akib, I. Setyo, and A. Wibowo. "Inclusive Education Practices: Fostering an Accessible Learning Environment for Diverse Learners." *Global International Journal of Innovative Research* 1, no. 3 (2023): 227-232. https://doi.org/10.59613/global.v1i3.35.

[5] Aldhilan, D., S. Rafiq, and A. Afzal. "Navigating Barriers and Building Pathways: Inclusive Education for Children with Special Needs." *F1000Res* 14 (2025): 1-21. https://doi.org/10.12688/f1000research.172211.2.

[6] Alfarwan, A. "Personalization AI Use in K-12 Education: A Systematic Review." *Frontiers in Education* 10 (2025): 1-12. https://doi.org/10.3389/feduc.2025.1647573.

[7] Almgren Back, G., M. Mossige, H. Svendsen, V. Ronneberg, H. Selenius, N. Gottsche, G. Dolmer, L. Falth, S. Nilsson, and I. Svensson. "Speech-to-Text Intervention to Support Text Production among Students with Writing Difficulties: A Single-Case Study in Nordic Countries." *Disability and Rehabilitation: Assistive Technology* 19, no. 2 (2024): 1-20. https://doi.org/10.1080/17483107.2024.2351488.

[8] Alzahrani, M. "The Importance of Assistive Technology for Students with Disabilities in the Comprehensive Education Schools in the KSA." *Creative Education* 16 (2025): 453-476. https://doi.org/10.4236/ce.2025.164028.

[9] Annet, K. A. "The Role of Play in Early Childhood Education: Balancing Fun and Learning." *Eurasian Experiment Journal of Arts and Management* 5, no. 3 (2024): 31-34. https://www.researchgate.net/publication/383551094_The_Role_of_Play_in_Early_Childhood_Education_Balancing_Fun_and_Learning.

[10] Ashlan, S. "Inclusive Early Childhood Education for Children with Special Needs: Challenges and Strategies." *Journal of Gemilang* 2, no. 3 (2025): 45-55. https://doi.org/10.62872/kvf6br85.

[11] Cimino, S., A. Maremmani, and L. Cerniglia. "The Use of Artificial Intelligence (AI) in Early Childhood Education." *Societies* 15, no. 12 (2025): 1-16. https://doi.org/10.3390/soc15120341.

[12] Damyanov, K. "Effective Pedagogical Strategies and Support Mechanisms for Enhancing the Learning Outcomes of Students with Special Educational Needs: A Systematic Approach." *International Journal of Scientific Research and Management* 12, no. 10 (2024): 3700-3718. https://doi.org/10.18535/ijsrm/v12i10.el03.

[13] European Agency for Special Needs and Inclusive Education (EASNIE). *Ten Pillars Shaping the Future of Inclusive Education: Background Paper*. Odense: EASNIE, 2026.

[14] Fitas, R. "Inclusive Education with AI: Supporting Special Needs and Tackling Language Barriers." *AI and Ethics* 5, no. 6 (2025): 5729-5757. https://doi.org/10.1007/s43681-025-00824-3.

[15] Floridi, L., J. Cowls, M. Beltrametti, R. Chatila, P. Chazerand, V. Dignum, C. Luetge, et al. "AI4People—An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations." *Minds and Machines* 28, no. 4 (2018): 689-707. https://doi.org/10.1007/s11023-018-9482-5.

[16] Holmes, W., and I. Tuomi. "State of the Art and Practice in AI in Education." *European Journal of Education* 57, no. 3 (2022): 1-29. https://doi.org/10.1111/ejed.12533.

[17] Holmes, W., M. Bialik, and C. Fadel. *Artificial Intelligence in Education: Promises and Implications for Teaching and Learning*. New York: Center for Curriculum Redesign, 2019.

[18] Hong, N. T. "Inclusive Educational Measures for Children with Autism Spectrum Disorder Attending Some Primary Schools in Ho Chi Minh City." *International Journal of Multidisciplinary Research and Analysis* 9, no. 3 (2026): 1270-1275. https://doi.org/10.47191/ijmra/v9-i3-43.

[19] Kaji, S., and J. Dutta. "Challenges and Barriers Faced by Teachers in Inclusive Classrooms: A Study." *International Journal of Research and Innovation in Social Science* 10, no. 2 (2026): 4911-4920. https://doi.org/10.47772/IJRISS.2026.10200362.

[20] Kauliņa, A., D. Voita, I. Trubina, and T. Voits. "Children with Special Educational Needs and Their Inclusion in the Educational System: Pedagogical and Psychological Aspects." *SIGNUM TEMPORIS* 8, no. 1 (2016): 37-42. https://doi.org/10.1515/sigtem-2016-0015.

[21] Kooli, C., and R. Chakraoui. "AI-Driven Assistive Technologies in Inclusive Education: Benefits, Challenges, and Policy Recommendations." *Sustainable Futures* 10 (2025): 1-9. https://doi.org/10.1016/j.sftr.2025.101042.
[22] Lindner, K. T., and S. Schwab. "Differentiation and Individualisation in Inclusive Education: A Systematic Review and Narrative Synthesis." *International Journal of Inclusive Education* 29, no. 12 (2025): 2199-2219. https://doi.org/10.1080/13603116.2020.1813450.
[23] Ljungcrantz, L. "The Interaction of AI and Early Childhood Education: A State-of-the-Art Review 2020–2024." *Early Childhood Education Journal* 54, no. 1 (2026): 1-17. https://doi.org/10.1007/s10643-025-02079-3.
[24] Luckin, R., M. Cukurova, C. Kent, and B. du Boulay. "Empowering Educators to Be AI-Ready." *Computers and Education: Artificial Intelligence* 3 (2022): 1-11. https://doi.org/10.1016/j.caeai.2022.100076.
[25] Mawardi, K., R. Oktari, I. Sugiarta, and A. Abnisa. "The Influence of Parental Engagement on the Early Childhood Learning Process in the Classroom." *Al Tahdzib: Jurnal Pendidikan Islam Anak Usia Dini* 3, no. 2 (2024): 73-84. https://doi.org/10.54150/altahdzib.v3i2.615.
[26] Melo-Lopez, V. A., A. Basantes-Andrade, C. Gudino-Mejia, and E. Hernandez-Martinez. "The Impact of Artificial Intelligence on Inclusive Education: A Systematic Review." *Education Sciences* 15, no. 5 (2025): 1-25. https://doi.org/10.3390/educsci15050539.
[27] Moffat, T. "The Beauty of Universal Design for Learning (UDL) and Why Everyone in Early Childhood Education and Intervention Should Be Using It." *Kairaranga* 23, no. 1 (2022): 66-73. https://doi.org/10.54322/kairaranga.v23i1.281.
[28] Mutia, F., and I. Cahyani. "Assistive Technology to Enhance Access to Information for Student with Disabilities: A Case Study in Surabaya." *Khizanah al-Hikmah: Jurnal Ilmu Perpustakaan, Informasi, dan Kearsipan* 9, no. 1 (2021): 16-27. https://doi.org/10.24252/v9i1a3.
[29] Organisation for Economic Co-operation and Development (OECD). *Education Policy Outlook 2025: Nurturing Engaged and Resilient Lifelong Learners in a World of Digital Transformation*. Paris: OECD Publishing, 2025. https://doi.org/10.1787/c3f402ba-en.
[30] Pakpahan, F., and M. Saragih. "Theory of Cognitive Development by Jean Piaget." *Journal of Applied Linguistics* 2, no. 2 (2022): 55-60. https://doi.org/10.52622/joal.v2i2.79.
[31] Piaget, J. *The Moral Judgment of the Child*. London: Routledge & Kegan Paul, 1932.
[32] Piaget, J. *Construction of Reality in the Child*. London: Routledge & Kegan Paul, 1957.
[33] Piaget, J. "Intellectual Evolution from Adolescence to Adulthood." *Human Development* 15, no. 1 (1972): 1-12. https://doi.org/10.1159/000271225.
[34] Pianta, R. C., and T. Hofkens. "Defining Early Education Quality Using CLASS-Observed Teacher-Student Interaction." *Frontiers in Psychology* 14 (2023): 1-11. https://doi.org/10.3389/fpsyg.2023.1110419.
[35] Pradana, P., I. Sutajaya, and I. Suja. "Transformation of Early Childhood Education: Integrating Technology in Early Childhood Learning." *Journal of Gemilang* 1, no. 3 (2024): 9-19. https://doi.org/10.62872/jdbb8344.
[36] Priyadharsini, V., and S. Mary. "Universal Design for Learning (UDL) in Inclusive Education: Accelerating Learning for All." *Shanlax International Journal of Arts, Science and Humanities* 11, no. 4 (2024): 145-150. https://doi.org/10.34293/sijash.v11i4.7489.
[37] Ranbir, D. "Inclusive Education Practices for Students with Diverse Needs." *Innovative Research Thoughts* 10, no. 1 (2024): 142-146. https://doi.org/10.36676/irt.v10.i1.1405.
[38] Ritonga, D., J. Junaidi, and N. Nurfaisal. "Exploring Inclusive Education in Early Childhood: Perspectives, Practices, and Implementation." *AL-ISHLAH: Jurnal Pendidikan* 17, no. 1 (2025): 1600-1608. https://doi.org/10.35445/alishlah.v17i1.6744.
[39] Rumbidzai, T., and M. Achebe. "Exploring the Role of Early Childhood Education in Shaping Children's Future Development." *Educia Journal* 1, no. 2 (2023): 29-37. https://doi.org/10.71435/610402.
[40] Shneiderman, B. *Human-Centered AI*. Oxford: Oxford University Press, 2022. https://doi.org/10.1145/3538882.3542790.
[41] Sormunen, K., V. Yliverronen, and M. L. Ronkko. "Unveiling Young Children's Collaborative Communication in Hands-On Problem-Solving." *International Journal of Technology and Design Education* 36, no. 2 (2026): 1-26. https://doi.org/10.1007/s10798-025-10049-4.
[42] Strogilos, V., L. Lim, and N. Buhari. "Differentiated Instruction for Students with Special Educational Needs (SEN) in Mainstream Classrooms: Contextual Features and Types of Curriculum Modifications." *Asia Pacific Journal of Education* 43, no. 3 (2021): 1-17. https://doi.org/10.1080/02188791.2021.1984873.
[43] Suryaningsih, S., and E. Aisyah. "The Role of Technology in Improving Early Childhood Social Skills." *Education and Sociedad Journal* 1, no. 2 (2024): 53-61. https://doi.org/10.61987/edsojou.v1i2.598.
[44] UNESCO. *AI and the Future of Education: Disruptions, Dilemmas and Directions*. Paris: UNESCO, 2025. https://doi.org/10.54675/KECK1261.

[45] United Nations Educational, Scientific and Cultural Organization (UNESCO). *Global Report on Early Childhood Care and Education: The Right to a Strong Foundation*. Paris: UNESCO, 2021.
[46] Ventouris, A., C. Panourgia, and S. Hodge. "Teachers' Perceptions of the Impact of Technology on Children and Young People's Emotions and Behaviours." *International Journal of Educational Research Open* 2, no. 2 (2021): 1-10. https://doi.org/10.1016/j.ijedro.2021.100081.
[47] Vygotsky, L. S. *Mind in Society: Development of Higher Psychological Processes*. Harvard: Harvard University Press, 1978. https://doi.org/10.2307/j.ctvjf9vz4.
[48] Wea, D., E. L. Goal, and A. K. Wolomasi. "Implementation of Universal Design for Learning (UDL) in Inclusive Education: A Study of Primary and Secondary Education Units." *International Journal of Instruction* 18, no. 3 (2025): 531-548. https://doi.org/10.29333/iji.2025.18327.
[49] Zainudin, Z. "Elucidating Artificial Intelligence (AI) Framework in Educational Management." *City University eJournal of Academic Research* 6, no. 4 (2024): 1-24. https://www.city.edu.my/CUJAR.
[50] Zawacki-Richter, O., V. I. Marin, M. Bond, and F. Gouverneur. "Systematic Review of Research on Artificial Intelligence Applications in Higher and Early Education." *International Journal of Educational Technology in Higher Education* 19, no. 1 (2022): 1-36. https://doi.org/10.1186/s41239-022-00338-4.