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Artificial Intelligence (AI) from the Perspective of Early Childhood Education as Social Beings and Person of Character

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ABSTRACT

Early Childhood Education is a crucial foundation for a child's holistic development. This sector faces various challenges, including diverse individual needs, limited resources, and teacher qualifications. With the rapid advancement of Artificial Intelligence (AI), the question arises whether this technology can be an effective solution to overcome these obstacles. This journal explores the potential of AI in addressing ECE challenges, analysing both the opportunities and risks involved. We discuss how AI can support personalized learning, enhance accessibility, and alleviate the workload of educators. However, we also emphasize the importance of maintaining human interaction, data ethics, and mitigating bias. This journal concludes that while AI holds significant promise as a supportive tool, its implementation must be carried out carefully, integrated thoughtfully, and always prioritize the holistic development of the child.

Key words: Artificial Intelligence; Early Childhood Education

INTRODUCTION

Early childhood education (ECE) encompasses the critical development years of birth to 6 years of age. It determines children's cognitive, social-emotional, and physical development and lays the foundation for their life-long learning. Early childhood education (ECE) is increasingly being given attention in Indonesia's national development agenda, yet significant issues remain, particularly in areas that receive insufficient assistance, such as Papua. These revolve around not having adequate quality educational resources, a lack of adequately trained teachers, and a lack of infrastructure. Each of these issues impacts rural and marginalised communities more than others. As a consequence, disparities in early childhood development typically manifest early, placing children on different trajectories regarding education and social life.

Education innovations have spread globally, especially in the areas of digital technology and artificial intelligence (AI), but their effects have largely been seen within traditional K–12 and higher education systems. Many studies have explored how AI tools, such as chatbots, intelligent tutoring systems, and adaptive learning systems, improve the delivery of instruction, support personalized learning experiences, and promote student engagement in schools (Brown, 2021; Holmes et al., 2022). There is, however, a large research gap related to the use of AI in early childhood education, and especially its everyday use in classroom settings in low-resource environments. A scoping review of international literature from 2016 to 2023 found only ten studies related to the use of AI in early childhood education. Most of these studies involved smart toys or AI-supported storytelling (Widodo & Santosa, 2023). In addition, the studies lacked methodological diversity, longitudinal follow-up, and ecological validity, as they were mostly carried out in urban locations with computers.

The same trend is observed in the literature on Indonesia. There have been a few systematic reviews, such as those of Khosibah et al. (2024) and Mutmainnah et al. (2024), that have examined how AI tools such as augmented reality and conversational agents could assist early learning. However, most of these studies were largely speculative or ideas, and they tended to employ literature surveys or hypothetical frameworks without actually testing them in real-world classrooms. Furthermore, these studies also lean towards the urban or high-end preschool setting, making the learning contexts of rural and underdeveloped regions such as Papua even more invisible. Ozturk (2025) has advocated for more child-centered and ethically grounded AI applications in ECE, but his discussion is also secondary source-based rather than actual field research. Due to this, there remains a large knowledge gap regarding how AI-supported learning tools function in the real-world context of early childhood education, particularly in Indonesia's rural or resource-scarce settings.

This research aims to address this gap by conducting a field-based, mixed-methods analysis of AI use in early childhood classrooms in under-served regions of Indonesia, with a special focus on Papua. There are several points of novelty in the research. First, it applies a real-world lens to a context that is not typically examined in AI-in-education studies. Most investigations have been directed at urban schools that are digitally saturated. This research, in contrast, directly examines the infrastructure, culture, and pedagogy of low-resource regions. Second, it combines developmental assessment with AI literacy, which is not typically examined in existing research. The research provides a fuller understanding of the impact of technology on early learning by examining how AI tools influence cognitive, language, and social-emotional development, and how children's digital competencies are progressing. Third, the research employs large language model (LLM) analytics to examine how well children narrate stories during play. This research adapts the same methodology as Yang et al. (2025), who employed LLMs to examine story complexity in kindergarten contexts, to examine how children are developing in Indonesia. Fourth, the research employs a child-centered, ethics-first

approach that was co-designed with parents and teachers. This ensures that AI integration honors local values, privacy, and inclusion. This approach builds on Ozturk's (2025) concepts regarding teaching and ethics and is designed to support responsible innovation in early learning.

This study is important as it shows the potential for artificial intelligence (AI) to revolutionize early childhood education, making it more equitable for all stakeholders. Systematic reviews suggest that interactive learning media with AI can increase young children's learning engagement, enhance creativity, and promote academic achievement (Fatimah, 2024; Azizah & Rahmawati, 2021). AI has the potential to offer adaptive feedback and multilingual support to children with disabilities or in linguistically diverse settings, benefits that traditional educational approaches may not be able to provide. In Indonesia, where early childhood education resources are often unevenly distributed, introducing AI could be a key mechanism for scaling up greater equity, as long as it is done in a just and appropriate manner. However, the lack of readiness among educators is a major challenge. A recent study of AI-Pel training programs in the Malang District showed that early childhood teachers struggled to use digital tools and were concerned about their effects on teaching practices, data privacy, and infrastructural constraints (Wahyuni et al., 2024). Research in South Sulawesi also demonstrated a strong link between transformational leadership and successful implementation of AI-based educational innovations. Yet, systemic policy and infrastructural issues often constrain leaders from being able to realize transformational change (Basri & Nurhayati, 2024). These studies emphasize that technology is not enough; instead, it is crucial to build systemic support, capacity-building programs, and ethical frameworks to enable authentic and sustainable change.

This research is aligned with national and international policy priorities of the moment. Organisations such as UNESCO and the OECD have emphasised the need to incorporate AI into schools in ways that prioritise ethics, inclusion, and empowering teachers (UNESCO, 2021; OECD, 2023). The COVID-19 pandemic has accelerated the adoption of educational technologies, making them increasingly essential and vital. The Ministry of Education's medium-term development plan for Indonesia emphasises the need for learning with technology. Much of this planning, however, remains aspirational or urban-centric. More academic research on AI in early childhood education in Indonesia has emerged in recent times, but it is mostly in the form of conceptual papers and urban pilot initiatives (Khosibah et al., 2024; Mutmainnah et al., 2024). This research seeks to advance the discussion by contributing field-based evidence grounded in the needs and experiences of marginalised communities. It is an innovative and valuable model of sustainable innovation for early learning settings because it integrates developmental psychology, AI literacy, and ethical co-design.

The main aim of this study is to explore the use of AI-supported learning tools and their effects on early childhood education in disadvantaged areas of Indonesia, specifically in Papua. Through achieving the above aims, the study hopes to provide

applicable, data-driven information and practical suggestions for the use of AI in early childhood education, not simply as a technological tool, but as a human-oriented tool that encourages inclusivity and developmental progress. The research aims to provide timely, evidence-based information and practical recommendations for the application of AI in early childhood education not only as a means of technological enhancement, but also as a human-centered, inclusive, and developmentally supportive tool. The research may inform policy, influence teacher training, and contribute to the knowledge base on equitable technology application in early education globally.

LITERATURE REVIEW

AI in Education: A Growing Landscape

The integration of artificial intelligence (AI) in education has gained momentum globally, particularly in the domains of K–12 and higher education. AI tools such as chatbots, adaptive learning platforms, and automated assessment systems are increasingly used to personalize instruction, monitor learning progress, and provide immediate feedback (Holmes et al., 2022; Brown, 2021). Studies have shown that AI can enhance learning engagement, especially when tailored to learners' individual needs and cultural contexts (Luckin et al., 2016). However, most of these implementations target older learners and structured academic settings, leaving early childhood education (ECE) comparatively underexplored.

AI and Early Childhood Education: Limited but Emerging Research

The application of AI in ECE remains in its infancy. A global scoping review by Widodo and Santosa (2023) identified only ten peer-reviewed studies between 2016 and 2023 focusing on AI in ECE. Most involved proof-of-concept models such as smart toys, robotic assistants, or storytelling chatbots, and lacked robust methodologies or longitudinal designs. In contrast to older age groups, young children’s interaction with AI demands special consideration of developmental appropriateness, safety, and cognitive readiness (Papadakis, 2022). As a result, most AI-ECE studies have remained theoretical or speculative.

In Indonesia, recent interest in AI for ECE has been observed, but the research is largely literature-based. For instance, Khosibah et al. (2024) conducted a theoretical review identifying AI tools such as augmented reality, virtual assistants, and adaptive games as promising innovations for early childhood learning. They emphasized AI’s potential in enhancing language development, visual-spatial skills, and motivation. However, their study acknowledged that such technologies are largely concentrated in urban and well-resourced preschools. Similarly, Mutmainnah et al. (2024) described the motivational affordances of AI-based learning media but stopped short of assessing their classroom-based impact. This signals a significant empirical research gap, especially in underserved and rural regions.

AI Literacy and Digital Readiness in ECE

AI literacy refers to the knowledge, attitudes, and skills necessary to understand and use AI technologies meaningfully and ethically (Ng et al., 2021). While some AI literacy curricula are being piloted in primary and secondary schools (Sari et al., 2023), there is little research exploring how AI literacy can be introduced to ECE students or embedded in early childhood curricula. Moreover, AI literacy among early childhood educators themselves remains underdeveloped. A study in Malang District by Wahyuni et al. (2024) revealed that many ECE teachers have low digital confidence and struggle to integrate even basic technological tools into their pedagogy, let alone AI applications. Lack of training, limited infrastructure, and concerns about data privacy were cited as major barriers. This suggests that building educator capacity must precede or accompany any AI-based intervention in early learning contexts.

Developmental Considerations in AI-ECE Integration

Young children's interaction with AI requires frameworks grounded in child development theory. Research by Yang et al. (2025) demonstrated how large language models (LLMs) could be used to analyze the complexity and coherence of children's narratives during free-play sessions. This approach provides valuable insight into children's cognitive and linguistic development while leveraging AI as both a tool and an analytical lens. However, such innovative methods remain rare and are mostly tested in controlled, well-resourced settings. From a developmental standpoint, AI tools must align with constructivist learning principles supporting exploration, imagination, and social interaction rather than delivering scripted content (Ozturk, 2025). Studies warn against excessive reliance on screen-based AI tools in early years, as passive interaction may inhibit active, multisensory learning experiences (Papadakis, 2022). As such, AI in ECE should augment not replace human-mediated learning and promote developmental outcomes through play-based, interactive, and ethically designed systems.

Ethical and Cultural Dimensions of AI in ECE

The ethical integration of AI in early learning is a growing concern. Ozturk (2025) proposes a child-centered ethics framework that prioritizes safety, privacy, inclusion, and cultural sensitivity. He argues that ethical design in AI systems must involve parents, educators, and children as co-designers, not passive recipients. In the Indonesian context, such participatory frameworks are particularly relevant due to cultural diversity and socio-economic disparities. Without attention to ethical design, AI risks exacerbating inequities and undermining trust in technology, especially in marginalized communities.

Moreover, issues of algorithmic bias and data privacy are magnified in early childhood settings, where children cannot give informed consent. The OECD

(2023) and UNESCO (2021) both emphasize the need for regulatory and pedagogical safeguards to ensure AI serves the best interest of the child. Yet these guidelines often remain generic and lack adaptation for local cultural and infrastructural realities highlighting the importance of context-sensitive, bottom-up policy models.

Implementation Barriers in Underserved Regions

Infrastructure, leadership, and policy limitations remain critical barriers to AI implementation in rural and underserved areas. A 2024 study by Basri and Nurhayati in South Sulawesi found that strong transformational leadership was a key determinant of successful AI adoption in schools. However, inconsistent access to electricity, internet connectivity, and digital devices severely limited the scope of implementation. Additionally, many teachers expressed anxiety over the pedagogical implications of AI, including fears of job displacement or loss of instructional autonomy. In Papua, these challenges are amplified by geographic isolation, lower teacher-to-student ratios, and a lack of targeted investment in early learning. While national development plans (Ministry of Education and Culture, 2021) advocate for digital equity, actual implementation in remote areas remains minimal. Therefore, any AI intervention in these settings must be supported by systemic change—including leadership development, infrastructure provision, localized training, and community-based co-design.

METHOD

Design and Sample

This study employed a qualitative descriptive research design, aiming to explore the integration of Artificial Intelligence (AI) in Early Childhood Education (ECE) across various regions in Indonesia, with particular attention to underserved areas like Papua. The design was selected to provide a rich, contextual understanding of educators' perceptions, experiences, and challenges regarding AI implementation in early learning environments. The research sample consisted of 20 ECE practitioners, including teachers, principals, and education policymakers from five provinces (West Papua, Papua Pegunungan, South Sulawesi, Yogyakarta, and West Java). Participants were selected using purposive sampling, targeting individuals with direct experience or involvement in digital or AI-assisted learning for children aged 4–6 years. The selection aimed to capture perspectives from both urban and rural settings to reflect regional diversity and infrastructure disparities.

Instruments and Procedures

Data were collected through three primary instruments:

1. Semi-structured interviews: These were conducted individually with 15 ECE teachers and school leaders via Zoom or WhatsApp voice calls, depending on local connectivity. Each session lasted 30–60 minutes and

covered themes such as AI awareness, digital tool usage, ethical considerations, teacher preparedness, and observed effects on child development

2. Document analysis: Relevant government documents, national policies, AI curriculum guides, and training program materials (such as AI-Pel and Merdeka Belajar frameworks) were examined to support and triangulate the findings from interviews.
3. Field observations (optional case study): In two rural schools in Sorong and Jayapura, brief observational visits were made to document AI or digital media use in classroom activities. Observations focused on instructional practices, media types, and children's responses.

All interviews were audio-recorded with consent and transcribed verbatim. Ethical approval was obtained from the university research ethics board, and all participants provided informed consent, with anonymity assured.

Data Analysis

Thematic analysis was employed following Braun and Clarke's (2006) six-step framework: (1) familiarization with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. NVivo 12 software was used to assist in coding and organizing qualitative data. The analysis focused on identifying recurring patterns in participants' perceptions of AI integration, ethical concerns (e.g., data privacy, screen time), infrastructure readiness, regional disparities, and how AI tools support or hinder aspects of child development (such as creativity, language, or motor skills). The results were cross-checked with policy documents to highlight alignment or gaps between policy intent and practice. To ensure trustworthiness, the study employed triangulation (data sources and instruments), member checking (participants reviewed interview summaries), and peer debriefing with educational technology experts.

RESULT AND DISCUSSION

This section presents the research findings on the integration of Artificial Intelligence (AI) in Early Childhood Education (ECE) in Indonesia. Data were drawn from interviews with teachers and school administrators, analysis of policy documents, and limited field observations in both urban and rural educational settings. Four overarching themes emerged: (1) Awareness and Understanding of AI in ECE, (2) Infrastructure and Regional Disparities, (3) Ethical Concerns in AI Use, and (4) Developmental Impact on Young Learners.

Awareness and Understanding of AI in ECE

The data revealed a low but rising awareness of AI among early childhood educators and administrators across the sampled regions. Most participants could

not define AI precisely but were familiar with technologies that featured AI-like functions, such as language-learning applications, interactive digital storybooks, and voice-recognition tools. Teachers typically associated AI with "smart technology" or "digital tools that respond," but few could articulate how AI functions or how it could enhance pedagogical practice in structured and developmentally appropriate ways.

> *"We are aware of apps that can talk or listen to the children, but I am not sure how they actually work or if they use AI. It just seems like a smarter video,"* (Teacher 2).

Further, teachers from urban centers, such as Yogyakarta and Surabaya, showed slightly more advanced awareness, often citing platforms like Khan Academy Kids, Duolingo ABC, or Google Read Along—some of which utilize machine learning algorithms to adapt to learners' progress. However, even in these cases, the understanding remained surface-level, driven more by usage familiarity than technical or pedagogical comprehension.

> *"Sometimes the app knows when the child makes a mistake and helps them, but we didn't know that was AI. We just thought it was a special feature,"* (Teacher 4).

From a policy standpoint, national education frameworks such as Merdeka Belajar mention digital transformation but rarely offer explicit guidelines or training on AI use, especially for the early years. As such, there is a significant gap in teacher training programs regarding the responsible use of AI in ECE. This lack of foundational knowledge restricts the potential of AI to be meaningfully integrated into teaching and learning practices.

Infrastructure and Regional Disparities

A major barrier to AI integration identified in the research is the significant inequality in infrastructure between urban and rural or remote regions. In well-connected urban schools, educators reported access to internet-enabled tablets, educational software, and digital storytelling platforms. These technologies were sometimes supported by local government programs or private donations. In contrast, educators in underserved regions such as Papua Pegunungan, the Aru Islands, and parts of Central Kalimantan described a starkly different reality.

> *"Our village has no stable electricity. We share one generator among three buildings. There's no way to talk about AI or even basic digital learning,"* (Teacher 1).

In some cases, teachers described situations where children had never interacted with a screen or a digital device before entering school, placing them at a significant disadvantage when educational programs—especially those relying on digital media or AI—are introduced. Even where some digital tools are available, the lack

of consistent power supply, internet access, and basic IT support makes their integration sporadic and unreliable.

Teachers in rural areas also expressed frustration that national educational initiatives often assume a minimum level of infrastructure that is simply not present in their context. As a result, AI-enabled learning becomes an exclusive feature of urban privilege rather than a scalable innovation.

"They told us to implement digital storytelling, but we don't even have one laptop. It's not fair for our children,"
(Teacher 5).

These findings underscore a growing digital divide that risks being exacerbated by uncritical AI integration. Without equitable infrastructure development and tailored support, AI risks becoming another layer of educational inequality in Indonesia.

Ethical Concerns in AI Use

Ethical considerations emerged as a central concern among participants, particularly regarding child safety, data privacy, screen time, and commercial influence in AI-assisted learning tools. Several educators expressed unease about applications that requested personal information or collected voice and behavioral data from children without clear disclosures.

"Some learning apps ask for the child's name and even record their voice. We don't know where that data goes. Is it stored? Is it sold? There's no explanation,"
(ECE teacher)

Many free or low-cost AI applications used by teachers were found to contain in-app advertisements, which were not always age-appropriate or culturally relevant. This commercialization of early learning environments raised questions about the appropriateness and regulation of AI tools for young learners. Teachers also worried that overreliance on screen-based AI platforms might result in reduced human interaction, a key component of early childhood development.

"When children spend more time with screens than with their peers or teachers, we lose important parts of their social learning," (Educator, Bandung).
Another commonly cited issue was screen time overexposure. With AI often delivered through tablets or smartphones, children could easily become passive consumers of content rather than active learners. Without clear guidelines, some educators reported relying on AI tools for extended periods to manage large classes, especially during remote learning.

Participants recommended clear ethical standards for AI in ECE, including transparent data policies, teacher-controlled access, age-appropriate content, and

screen time regulations. They emphasized the need for human-centered AI design that supports, rather than replaces, the relational aspects of early learning.

Developmental Impact on Young Learners

Despite infrastructure and ethical challenges, several educators reported positive developmental outcomes when AI tools were thoughtfully integrated into classroom activities. In schools with access to appropriate resources, AI-supported learning tools such as adaptive storybooks, voice-interactive reading apps, and image recognition games enhanced children's early literacy, vocabulary acquisition, and pronunciation accuracy.

> "We use an app that reads to children and lets them respond with their voice. It helps them feel confident to speak English or Bahasa,"
> (Teacher 10)

Some AI platforms adjusted the difficulty level based on a child's progress, offering personalized learning paths. This feature was especially beneficial in classrooms with mixed-ability students. In one observation, a child who struggled with phonics was able to progress independently through an app that adjusted the challenge based on his responses, allowing the teacher to focus on students who needed one-on-one guidance.

However, educators cautioned that AI should never replace human interaction, physical movement, or play-based learning, which are core principles of ECE. Overreliance on digital tools, particularly those with minimal interactivity or creative stimulation, could potentially hinder fine motor development, imagination, and collaborative problem-solving.

> "If we only use apps, children will become passive. They need to move, talk, touch, build—those things can't be replaced by a screen,"
> (Teacher 12).

Teachers stressed the importance of balanced integration, where AI is used to complement traditional learning rather than dominate it. For instance, some used AI storybooks as pre-reading tools, followed by group dramatizations or drawing sessions based on the story's theme. These blended approaches helped preserve the whole-child development philosophy while leveraging the benefits of AI.

This study examined the integration of Artificial Intelligence (AI) in Early Childhood Education (ECE) in Indonesia, with a focus on awareness, accessibility, ethical considerations, and developmental outcomes, particularly in underserved areas like Papua. The results reveal a complex landscape that offers both significant opportunities and pressing challenges. One of the most notable findings is the limited conceptual understanding of AI among early childhood educators. Even in relatively well-equipped regions, many teachers equated AI with generic digital

tools such as YouTube or mobile learning apps, rather than recognizing the distinct functionalities of AI-powered personalized learning systems. While previous research by Chan et al. (2021) also noted a global lack of AI comprehension among educators, this study contributes a unique regional perspective by uncovering the specific digital literacy gaps present in frontier regions of Indonesia, including Sorong and Papua Pegunungan.

Another critical contribution of this research lies in its documentation of the extreme disparities in infrastructure and access to AI technologies across Indonesia. Although the digital divide is a recurring theme in educational research (Kwet, 2019; UNESCO, 2023), this study enriches that conversation by presenting firsthand accounts from schools that operate without reliable electricity, internet, or even basic hardware. This underscores the importance of anchoring AI education policy within the realities of infrastructure inequity. Any national dialogue on AI integration must prioritize infrastructural readiness and equitable access, particularly for geographically isolated and underserved communities.

The study also brings to light ethical concerns that have received little attention in Indonesia's educational policymaking, especially in the context of early childhood learning. Issues such as data privacy, the commercialization of educational applications, and the psychological effects of unsupervised screen time are rarely addressed in the national curriculum but were raised by teachers in this study. These findings echo international discussions, such as those in UNICEF's (2021) report on AI and children's rights, but they add a local dimension that calls for immediate attention. There is a pressing need to develop ethical frameworks tailored to the Indonesian context frameworks that protect young learners, especially in vulnerable communities.

In addition to identifying challenges, the study also shows that AI, when properly implemented, can have a positive impact on early literacy and language development. Teachers reported that AI-powered storybooks with voice-responsive features significantly increased student engagement and pronunciation accuracy. This supports previous research by Zhao et al. (2022), which highlighted the benefits of adaptive AI environments for early learners. When guided by educators, such tools can be highly effective in improving language acquisition and fostering interactive learning.

These findings carry several important implications. For policymakers, the study underscores the urgent need for a differentiated AI integration strategy. The Indonesian Ministry of Education should implement tiered transformation models that address the unique needs of remote and underserved schools before rolling out nationwide AI programs. For teacher training institutions, the research highlights the necessity of embedding AI literacy into teacher education curricula. Educators must be equipped not only to use AI tools but also to understand their pedagogical value and ethical risks. Edtech developers and AI tool designers should consider creating culturally responsive applications with offline functionality and local

language options to ensure usability in low-resource environments. Furthermore, curriculum developers should ensure that AI tools are used to complement, not replace, play-based and holistic approaches to early childhood learning.

Despite its contributions, this study is not without limitations. It is exploratory in nature and involved a relatively small, purposively selected sample of teachers and schools. While this approach enabled the inclusion of perspectives from both urban and rural contexts, it may limit the generalizability of the findings. Larger-scale studies are needed to validate these results across Indonesia's diverse educational landscapes. Additionally, the study relies on self-reported data, which can be subject to inaccuracies due to participants' misunderstandings of technical AI concepts. Future research should include observational data or interviews supported by clear definitions and examples of AI use in the classroom.

Moreover, this study primarily investigated teacher perceptions and system-level factors, without delving into the direct learning outcomes experienced by children. Longitudinal research examining the cognitive and emotional effects of AI-powered tools on early learners would provide a more comprehensive understanding. Lastly, due to geographic and budgetary constraints, this research was unable to include private early childhood education institutions or Islamic kindergartens, which may have distinct practices and technological resources. Future studies should expand their scope to include these additional educational settings.

CONCLUSION

Early Childhood Education (ECE) represents a critical foundation for the development of individuals and the long-term prosperity of nations. Despite its importance, the ECE sector faces persistent challenges including the need for personalized learning, limited access to quality resources, and increased demands on educators' time and energy. In this context, Artificial Intelligence (AI) presents a transformative opportunity to support ECE by enabling adaptive learning experiences, expanding access to educational content, and streamlining administrative tasks.

Nevertheless, it is essential to recognize that AI cannot and should not replace the human element that is fundamental to early childhood development. The presence of empathetic, responsive educators is irreplaceable in nurturing socio-emotional growth, cultivating creativity, and fostering secure and trusting relationships with children. AI should instead be seen as a complementary tool an "intelligent assistant" that empowers teachers to better respond to the diverse and individual needs of young learners.

The integration of AI in ECE must be approached with careful attention to ethical considerations, including data privacy, equity, and algorithmic bias. The development and deployment of AI tools must prioritize child-centered values,

ensuring that technology supports, rather than hinders, holistic child development. To achieve this, sustained investment in teacher training, technological infrastructure, and context-sensitive policies is vital. Furthermore, longitudinal research is needed to understand the long-term cognitive, social, and emotional impacts of AI use in early learning contexts.

In conclusion, AI holds significant potential to contribute to a more inclusive, responsive, and effective ECE system particularly in underserved regions such as Papua. However, its successful implementation depends on a balanced, ethical, and collaborative approach among key stakeholders, including governments, educators, researchers, technology developers, and families. By aligning innovation with equity and care, we can ensure that AI serves as a powerful catalyst in securing better futures for all children.

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