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Unlocking the potential: Transformative applications of generative AI in East Kalimantan's educational landscape

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ABSTRACT

AI systems like ChatGPT are rapidly changing education, giving teachers both new opportunities and new problems to deal with. This study investigates ChatGPT's evolving importance in the educational environment of East Kalimantan, focusing on educators' and practitioners' perceptions of its advantages, constraints, and ethical considerations. A qualitative design was used, incorporating semi-structured interviews with 15 participants (N=15), comprising teachers, administrators, and vocational instructors from various educational tiers. Participants were intentionally recruited through professional networks to ensure a representation of various institutional contexts. Data were gathered from March to May 2024 and examined through reflexive thematic analysis to discern the main themes and interpretive significances. Strict adherence to ethical protocols was maintained, including informed consent, secrecy, and voluntary participation. Nine themes emerged: Catalyst for Innovation, Enhancing Accessibility, Efficiency, and Teacher Support, Threat to Critical Thinking, Ethical Dilemmas, Digital Divide, Balancing Human Interaction, Depersonalization of Education, and Continuous Adaptation. The results show that ChatGPT encourages personalized learning, language inclusion, and efficient teaching, but also raises ethical concerns and exacerbates digital inequalities. Participants stressed the importance of teacher guidance, interpersonal connections, and institutional policies to ensure responsible use. The study finds that for ChatGPT to work well, teachers must continue learning, there must be ethical governance, and the digital infrastructure must be fair. This research, despite its regional limitations and reliance on self-reported data, offers significant insight for policymakers and educators addressing AI integration in evolving educational frameworks.

Keywords: chatGPT, artificial intelligence, education, pedagogy, technology-enhanced learning

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INTRODUCTION

The education sector in East Kalimantan, Indonesia, is on the verge of a disruptive period, primarily driven by rapid advancements in artificial intelligence (AI) technology. The twentieth century has witnessed a significant transformation in the educational scene, driven by technological advancements, particularly the advent of AI (Bitzenbauer, 2023; Currie et al., 2023; Gilson et al., 2023). The advancement and enhancement of machine learning have led to the emergence of novel AI technologies, particularly generative artificial intelligence (AI) (Hu, 2022; Kuzior & Sira, 2025; Brodny & Tutak, 2025). Generative AI, functioning within an unsupervised or semi-supervised machine learning paradigm, has the potential to transform educational content creation by employing statistical and probabilistic techniques (Rusandi et al., 2023; Zamfiroiu et al., 2023).

Advancements in deep learning (DL) have allowed generative AI to produce educational resources, including videos, images, text, and audio, by examining training data, identifying patterns, and replicating content dissemination (Rudolph et al., 2023; Crawford et al., 2023;

Karthikeyan, 2023; Kılınç, 2023; Situmorang et al., 2023). The evolving technological landscape presents numerous opportunities to improve educational experience in East Kalimantan.

In the domain of generative AI, two prominent methodologies have emerged: Generative Adversarial Network (GAN) and Generative Pretrained Transformer (GPT) (Cheong & Hong, 2023; Tsang, 2023; Uddin et al., 2023; Yilmaz & Karaoglan Yilmaz, 2023). These methodologies have the potential to transform the delivery and experience of education in East Kalimantan by leveraging AI's capabilities to tackle educational challenges and uncover new opportunities.

This paper examines the revolutionary potential of artificial intelligence, namely generative AI, within the educational landscape of East Kalimantan. We explore the complexities of AI technologies such as GAN and GPT, analyzing their uses, advantages, and limitations within the educational domain. Additionally, we examine how these technologies could enhance and enrich the educational framework in East Kalimantan, promoting novel methodologies for instruction, learning, and student participation.

In the following sections, we will explore the uses of generative AI in education, highlighting its ability to improve content generation, customization, and accessibility. We will examine the problems and ethical implications related to the incorporation of AI in education. As East Kalimantan adopts AI in education, it is essential to approach this revolutionary process with a comprehensive awareness of the possible advantages and accompanying obligations.

This study is organized into six principal sections that provide a systematic examination of the influence of AI on education: Section 1, the Introduction, establishes the research setting; Section 2, the Literature Review, examines current AI applications in education; Section 3, Methodology, details the qualitative research approach, data collection techniques, and ethical considerations; Section 4, Analysis of Qualitative Data, showcases study results; Section 5, the Discussion, analyzes findings and their implications; and Section 6, the Conclusions, encapsulates key findings, emphasizing their importance in furthering the domain of AI in education.

This study aims to address several guiding research issues that align with its analytical objectives. This study examines the perceptions of educators, students, and administrators in East Kalimantan about the incorporation of ChatGPT and other generative AI technologies in educational settings; identifies the main facilitators and obstacles that affect their adoption and effective use; explores the ethical, pedagogical, and infrastructural challenges arising from the implementation of ChatGPT in local educational environments (Aithal & Aithal, 2023; Ali & OpenAI, 2023); and considers how these findings can guide future policy initiatives aimed at achieving equitable, human-centered and sustainable integration of AI within East Kalimantan's educational framework.

METHOD

This qualitative study is designed to examine the impact of ChatGPT on the educational landscape, specifically from the point of view of educators and practitioners. Semi-structured interviews were selected as the primary data collection method due to their flexibility and ability to investigate deeper into the experiences and perspectives of the participants. This approach allows for a rich, in-depth exploration of complex issues, moving beyond surface-level responses and capturing nuanced insights into ChatGPT's educational applications.

The study used a purposive sampling strategy that involved 15 participants, including educators, administrators and practitioners from various educational sectors, such as K–12 schools, higher education, vocational training, and professional development institutions in East Kalimantan, Indonesia. This diversity ensured a comprehensive representation of points of view at various educational levels and contexts. Participants were recruited through institutional networks, professional associations, and direct email invitations. Inclusion criteria required participants to have at least six months of experience using or supervising the use of ChatGPT or other generative AI tools in educational settings. All participants gave their informed consent prior to data collection.

Semi-structured interviews were conducted using a meticulously developed interview guide aligned with the study's research goals on perceptions, barriers, enablers, and policy

implications. The interviews covered key domains, including the professional background of the participants, their experiences with ChatGPT, perceived benefits, ethical and pedagogical challenges, and future expectations for AI in education.

The interviews were conducted between March and May 2024, either in person (n=5) or via Zoom/Google Meet (n = 10), depending on the preference of the participants. Each interview lasted approximately 45 to 70 minutes and was conducted primarily in Bahasa Indonesia, with occasional use of English technical terms. All sessions were recorded with permission and subsequently transcribed verbatim. The transcripts were translated into English where necessary and verified by a bilingual researcher for linguistic accuracy and contextual equivalence.

This study adhered to the principles of research integrity and ethical conduct in accordance with standard qualitative research practices. Formal ethical approval was not required because the research involved minimal risk and did not include any experimental manipulation, intervention, or procedures that could affect participants before or after the study. The research focused solely on collecting voluntary opinions and professional experiences from adult participants through semi-structured interviews.

All participants were informed of the purpose, voluntary nature, and confidentiality measures of the study prior to participation. Informed consent was obtained verbally and in writing prior to data collection. Participants were assured that their responses would remain anonymous, that no personal identifiable information would be disclosed, and that they could withdraw from the study at any time without penalty. Data were stored securely and used strictly for academic and research purposes.

Data was analyzed using reflexive thematic analysis (Braun & Clarke, 2021), chosen for its flexibility in capturing patterns of meaning while allowing researcher reflexivity in interpretation. The analytic process consisted of the following stages, as outlined in Table 1.

Table 1. The analytic process

Item	Explanation
Data Familiarization	The research team read and reread transcripts to gain an overall understanding.
Initial Coding	Text segments were coded inductively using NVivo software to identify relevant patterns.
Theme Development	The codes were organized into preliminary themes aligned with the research questions.
Review and Refinement	The themes were refined through iterative discussion to ensure internal coherence and conceptual clarity.
Reporting	The finalized themes were illustrated with verbatim quotations to provide contextual richness

Two researchers independently analyzed the data, comparing interpretations through peer debriefing sessions to ensure analytical consistency. Reflexive journaling was maintained to document interpretive decisions and minimize bias. Member checking was carried out with selected participants to validate the precision of the themes and their resonance with the experiences of the participants. These procedures improved the trustworthiness and credibility of the findings, ensuring that the interpretations authentically represented the perspectives of the participants.

FINDINGS AND DISCUSSION

Findings

This study explored how educators, administrators, and practitioners in East Kalimantan perceive the integration of ChatGPT in education. Through thematic analysis of semi-structured interviews, nine main themes emerged, reflecting the diverse experiences, opportunities, and concerns surrounding generative AI in teaching and learning. Each theme is presented with selected verbatim excerpts coded by participant initials, professional role, and location, followed by interpretive commentary that situates the findings within the regional educational context.

Theme 1: Catalyst for innovation

Participants described ChatGPT as a transformative tool that sparked pedagogical innovation and revitalized classroom participation. Many educators emphasized its role in promoting creativity and adaptive teaching practices.

"I can prepare lesson materials faster and tailor them to different levels of students. It makes my class more dynamic." (R001, Teacher)

"ChatGPT helps me create realistic scenarios for vocational students. They practice customer service conversations in ways that we could not before." (R002, Vocational Instructor)

"It helps me in designing reflective questions for students, encouraging them to think beyond the textbook." (R003, Lecturer)

"Previously, the preparation of the visuals took hours. Now I can focus on refining objectives instead of formatting slides." (R004, Curriculum Designer)

"I still plan to cancel the notifications when the signal drops, so once connected, we can continue seamlessly." (R005, Teacher)

Educators generally perceived ChatGPT as an intellectual partner rather than a simple automation tool. However, innovation remained uneven throughout the province, with urban educators benefiting more due to reliable connectivity and stronger institutional support. The results suggest that ChatGPT has redefined instructional creativity, but that technological readiness remains a key determinant of innovation capacity.

Theme 2: Enhancing accessibility

The participants agreed that ChatGPT broadened educational accessibility, especially for linguistically or geographically marginalized students. The tool was seen as a bridge connecting learners across regions and social backgrounds.

"My students often struggle with English terminology. ChatGPT instantly explains concepts in Bahasa, helping them grasp lessons more effectively." (R006, Language Teacher)

"With online learning, students who previously lacked resources can now access the same information and support as those in better-equipped schools." (R007, Course Developer)

"I used ChatGPT to help a student with speech difficulties. It became his voice during classroom presentations." (R008, Special Education Teacher)

"Parents have started using ChatGPT to help their children with homework, reducing the dependency on private tutoring." (R009, Parent-Educator)

"In some schools, the internet connection is still weak, making it difficult to use ChatGPT consistently." (R010, Principal)

While many respondents celebrated ChatGPT's linguistic flexibility and inclusive potential, others highlighted persistent infrastructural inequalities that limit digital access in rural districts. These findings show that AI can both bridge and expose educational disparities, depending on technological and socioeconomic conditions.

Theme 3: Efficiency and teacher support

Many participants acknowledged ChatGPT's capacity to improve efficiency and support educators in their professional duties. Technology was seen as a valuable tool to reduce workload and improve productivity.

"ChatGPT saves me hours of grading and feedback preparation. I can now focus on mentoring students individually." (R011, Secondary School Teacher)

"It helps me generate lesson outline, quizzes, and summaries very quickly." (R012, Lecturer)

"I use it to design teacher training materials and professional development content." (R013, Training Coordinator)

"ChatGPT inspires new lesson ideas, but I still refine them based on my experience." (R014, Senior Instructor)

"It feels like having an assistant who never tires, helping me stay organized." (R015, School Administrator)

Educators viewed ChatGPT as an empowering resource that complemented their work. By automating repetitive tasks, teachers could focus on reflective teaching and personal interaction. However, participants emphasized that human judgment and pedagogical expertise must remain central to the learning process.

Theme 4: Threat to critical thinking

Several participants expressed concern that ChatGPT may reduce students' involvement in critical thinking, encouraging superficial understanding and overreliance on instant answers.

Students now use ChatGPT to write essays and skip the whole thinking process." (R001, Lecturer)

"It promotes shortcut learning. They want quick answers, not explanations." (R002, Secondary School Teacher)

"When asked to defend their arguments, many struggle to explain what they wrote." (R003, College Tutor)

"Students become confident but intellectually passive; they rarely question what they read." (R004, Educational Researcher)

"They assume that AI-generated information is always correct, which weakens curiosity." (R005, Academic Coordinator)

However, some younger educators provided an alternative view.

"If guided properly, ChatGPT can model reasoning structures. Students can learn to critique their responses." (R006, Junior Lecturer)

The findings reveal contrasting pedagogical philosophies between senior and young educators. Technology itself is not inherently detrimental to critical thinking; rather, its impact depends on how it is embedded in classroom practices that promote active reflection.

Theme 5: Ethical dilemmas

Ethical issues emerged as a central topic, particularly with regard to plagiarism, authorship, and data privacy. The participants described a lack of institutional policies to guide responsible use.

"Students copy ChatGPT's text word for word, presenting it as their own." (R007, Instructor)

"There is confusion about whether AI-generated writing should be cited. We need clearer rules." (R008, Lecturer)

"Students sometimes enter personal details into ChatGPT without realizing the risks." (R009, IT Teacher)

"Teachers need digital ethics training. Many are unsure how to detect AI-written work." (R010, Administrator)

"Our problem is not plagiarism, we are still learning how to access ChatGPT in the first place." (R011, Teacher)

Therefore, ethical awareness was uneven across the sample. Urban educators prioritized integrity and data protection, while rural teachers emphasized access and understanding. The findings indicate that AI ethics education must be tailored to local contexts and levels of digital maturity.

Theme 6: Digital divide

The digital divide has emerged as one of the most critical and persistent challenges. Participants described how infrastructure and connectivity shaped the feasibility of ChatGPT integration.

"In some schools, students use ChatGPT every day, while in others, there is only one shared computer lab for hundreds of learners." (R012, Principal)

"Our internet connection is unstable, so I often rely on screenshots from my device." (R013, Science Teacher)
"Electricity outages make it difficult to sustain digital activities." (R014, Teacher)
"Teachers have strong motivation to innovate, but the lack of devices makes it challenging." (R015, Education Policymaker)
"Some communities now lend devices to help students explore AI tools together." (R001, NGO Coordinator)

The accounts depict a persistent technological imbalance that mirrors broader regional disparities. Educators show enthusiasm for digital innovation; however, the lack of infrastructure limits equitable implementation and widens the learning gap between rural and urban schools.

Theme 7: Balancing human interaction

Participants consistently emphasized the need to preserve genuine human interaction alongside the growing use of ChatGPT in education. Although they acknowledged the efficiency and accessibility provided by AI tools, they agreed that emotional connection, empathy, and social engagement are irreplaceable components of effective learning.

"Students need compassion and motivation, not only information." (R002, Early Childhood Educator)
"AI cannot detect emotions or frustration; that is something only teachers can perceive." (R003, Counselor)
"The most meaningful learning occurs through dialogue and shared reflection." (R004, Mentor Teacher)
"I use ChatGPT to support lessons, but the emotional engagement must come from me." (R005, Homeroom Teacher)
"For shy students, ChatGPT helps them rehearse their ideas before discussions." (R006, E-Learning Specialist)
"Technology makes teaching efficient, but it cannot replace trust and empathy." (R007, Senior Lecturer)

Educators viewed technology as a valuable instructional aid, but were cautious about letting it replace the human dimension of teaching. Collective sentiment reflects a desire for balanced integration, where AI complements rather than substitutes personal interaction. The participants stressed that learning is both a cognitive and emotional experience and that the presence of the teacher remains central in fostering curiosity, resilience, and belonging in the classroom.

Theme 8: Depersonalization of education

Several participants expressed concerns that overreliance on ChatGPT could depersonalize the learning experience, shifting education from a process of personal growth to one of transactional information exchange. They observed subtle but noticeable shifts in classroom dynamics as students interacted more with technology than with peers or instructors.

"AI cannot recognize when a student feel left behind or discouraged. It gives answers, but it does not offer understanding." (R20, Counselor)
"Education is becoming mechanical students ask questions, receive responses, and move on without reflection." (R05, Senior Teacher)
"Some students spend more time interacting with the screen than engaging in discussions. Reduce peer learning." (R17, Lecturer)
"The warmth that was used to define classroom relationships is fading. We are communicating efficiently, but less personally." (R21, Parent-Educator)
"When students rely too much on ChatGPT, the emotional and ethical dimensions of learning are neglected." (R14, Ethics Instructor)
"Used thoughtfully, however, ChatGPT can actually restore a personal touch by freeing teachers of repetitive paperwork so they can focus on mentoring." (R15, IT Lecturer)

While many participants viewed depersonalization as an emerging risk, others proposed that responsible use of ChatGPT could create new opportunities for meaningful interaction. By

automating routine tasks, teachers could redirect their energy to guiding, mentoring, and building rapport with students. The findings suggest that depersonalization is not an inevitable consequence of AI, but a reflection of how educators choose to position it within the learning process.

Theme 9: Continual adaptation

All participants highlighted the importance of continual adaptation as a prerequisite for effective integration of AI in education. Teachers and administrators emphasized the need for ongoing learning, institutional support, and peer collaboration to keep up with technological change.

"Teachers must evolve or risk becoming outdated. The classroom is changing faster than our training programs." (R13, Instructional Designer)

"Most of us learn by experimenting. There is no formal training, so we figure it out as we go." (R09, Senior Lecturer)

"Some educators are eager to use AI but lack the confidence or technical background to apply it effectively." (R01, Teacher)

"We formed informal peer groups to share ideas, prompts, and lesson plans. It is our way of learning together." (R15, IT Lecturer)

"Professional development programs rarely include AI literacy. That needs to change if we want teachers to keep up." (R11, Education Administrator)

"Young teachers tend to adapt quickly, but older ones feel uncertain about constant updates. Training must consider both groups." (R08, Vocational Trainer)

Participants viewed adaptability not merely as a technical skill, but as a mindset that values openness, experimentation, and resilience. They also expressed a need for structured institutional support, particularly in the form of professional training and policy guidance. The absence of coordinated strategies for the development of teacher capacity was seen as a major barrier to sustainable innovation. Many educators emphasized that long-term success depends on a collaborative culture of continuous learning rather than individual effort alone.

Table 2. Summary of thematic findings

Theme	Subtheme	Key Points
Catalyst for innovation	Personalized learning	Adaptation to individual learning needs
	Interactive learning	Engaging learners in dynamic experiences
Enhancing Accessibility	Language translation	Breaking language barriers for global access
	Inclusive education	Expanding educational access to remote learners
Efficiency and support	Automated grading	Time-saving and efficient grading
	Teacher empowerment	Supporting educators' professional growth
Threat to critical thinking	Overreliance on AI	Concerns about stifling independent thinking
	Superficial learning	Potential for shallow understanding
Ethical dilemmas	Academic integrity	Addressing plagiarism and ethical use
	Responsible Implementation	Guidelines for ethical ChatGPT usage
Digital divide	Access disparities	Bridging the digital divide for equitable access
	Resource distribution	Equitable allocation of ChatGPT resources
Balancing interaction	Human connection	Retaining the warmth of human interaction
	Holistic learning	Balancing technology with personal touch
Depersonalization	Emotional and social aspects	Potential impact on emotional aspects of learning
	Human-centered education	Maintaining the human essence of teaching
Continual adaptation	Proactive engagement	Staying informed and proactive in adaptation

To synthesize the patterns that emerged from the thematic analysis, the key themes and subthemes are summarized in Table 2. This summary provides a structured overview of the core ideas and interpretive dimensions identified in the participants' accounts, illustrating how

ChatGPT transforms educational practices through opportunities, challenges, and adaptive responses among educators and practitioners.

Discussion

The discussion synthesizes the thematic findings of this qualitative study, offering an integrated analysis of educators and practitioners' perspectives on the role of ChatGPT in education. The results provide a nuanced understanding of how AI tools, such as ChatGPT, shape pedagogical practices, accessibility, and institutional culture, while also revealing tensions around ethics, critical thinking, and human interaction (Ajevski et al., 2023). Each theme is discussed in depth, linking empirical findings to broader theoretical and practical implications and culminating in actionable recommendations for teacher professional development, institutional policy, assessment reform, and equitable digital transformation.

Theme 1: Catalyst for innovation

The theme of ChatGPT as a catalyst for innovation resonates strongly with educators and practitioners. They lauded its capacity to foster personalized learning experiences, which aligns with previous research highlighting the potential for AI-driven personalization in education (Sampson et al., 2020). The interactive learning dimension also finds support in the literature, emphasizing the role of AI in creating engaging and dynamic educational environments (Belyakova & Zakharova, 2020; Stewart et al., 2022). These findings underscore ChatGPT's potential to revitalize pedagogical practices, aligning with its reputation as a transformative tool in education.

However, the benefits of such innovation remain contingent on institutional and infrastructural readiness. Educators in digitally equipped schools reported greater experimentation and creativity compared to those in resource-constrained settings. This discrepancy mirrors previous findings that access to digital infrastructure shapes both teacher motivation and innovation outcomes. Therefore, the challenge is not only technological adoption but capacity building that empowers teachers to use ChatGPT creatively and responsibly (Adiguzel et al., 2023).

From a policy point of view, this implies the need for targeted teacher professional development (CPD) that focuses on prompt engineering, AI literacy, and digital curriculum design. Institutions could establish AI-based innovation hubs that allow teachers to develop and test new pedagogical strategies collaboratively. Such programs should not only emphasize the technical mastery of ChatGPT but also cultivate adaptive teaching mindsets that align AI use with student-centered learning goals.

Theme 2: Enhancing accessibility

The recognition of ChatGPT's role in enhancing accessibility to education echoes previous studies emphasizing the importance of technology in breaking down barriers (Gill et al., 2023). Its language translation capabilities, as highlighted by respondents, align with research emphasizing the global reach of online education (E. Bonsu & Baffour-Koduah, 2023; Mohammed et al., 2023). These findings emphasize ChatGPT's role as a democratizing force, expanding educational access to diverse linguistic communities and remote learners.

Nevertheless, persistent disparities in connectivity, device availability, and digital literacy constrain equitable access. While urban institutions leverage ChatGPT for blended learning and language translation, educators in rural contexts struggle with unstable internet and outdated technology. The findings highlight a dual reality: ChatGPT simultaneously bridges and reveals inequities, particularly where socio-economic and geographic divides are entrenched.

To address these disparities, inclusive technology policies must prioritize infrastructure investment and equitable resource distribution. Governments and schools can support access through device-sharing initiatives, community learning centers, and localized AI training workshops. Moreover, institutions should integrate AI accessibility modules in teacher training, emphasizing culturally and linguistically responsive pedagogy to ensure that ChatGPT's democratizing potential benefits all learners, not just those with digital privilege.

Theme 3: Efficiency and teacher support

The perspective that ChatGPT enhances efficiency and provides teacher support aligns with research on the benefits of AI in automating administrative tasks (Armitage, 2023; Atlas, 2023; Sallam et al., 2023). Previous studies have also recognized the potential of AI in alleviating educators from time-consuming grading duties, allowing them to focus on instructional activities (Fauzi et al., 2023; Lieberman, 2023). These findings reinforce that ChatGPT can improve the quality of teaching by reducing workload and streamlining routine processes.

However, some educators expressed concern that heavy reliance on automation might erode pedagogical reflection and professional creativity. The findings illustrate that AI integration must balance efficiency with the preservation of teacher autonomy and critical judgment. Technology should assist, not replace, the interpretive, relational, and reflective elements that define effective teaching.

To translate these insights into practice, institutions should introduce structured guidelines for AI use in lesson planning and assessment. Professional development initiatives could include AI-in-practice workshops that train educators to evaluate ChatGPT outputs rather than use them uncritically. Furthermore, schools can develop peer-review systems for AI-generated materials, ensuring quality assurance while fostering collaborative knowledge-building among teachers.

Theme 4: Threat to critical thinking

Skepticism about ChatGPT's impact on critical thinking skills reflects concerns raised in previous literature about the potential pitfalls of excessive reliance on AI-driven solutions (Alves de Castro, 2023; Naidu & Sevnarayan, 2023; Pavlik, 2023). The concern about superficial learning aligns with discussions on the importance of deep learning experiences (Iskender, 2023; Siegle, 2023). The participants observed that students increasingly rely on ChatGPT to produce ready-made answers, which can suppress inquiry and analytical reasoning.

However, some educators noted that when used strategically, ChatGPT can model structured reasoning, allowing students to critique, verify, or improve AI-generated responses. This aligns with constructivist approaches that treat technology as a scaffold for cognitive engagement. The findings thus suggest that ChatGPT's impact on critical thinking is mediated by pedagogy: it can either reinforce passive learning or promote reflective analysis depending on instructional design.

Educational institutions should therefore redesign assessment formats to encourage higher-order thinking in AI-mediated contexts. Assignments that require evaluation, comparison, or annotation of ChatGPT responses can teach students to identify errors and justify reasoning. In teacher CPD, emphasis should be placed on critical digital pedagogy, enabling educators to integrate ChatGPT as a dialogic partner rather than a content generator. These measures can preserve intellectual rigor while adapting assessment to the realities of AI-supported learning.

Theme 5: Ethical dilemmas

The ethical dilemmas associated with ChatGPT have been discussed in previous studies, emphasizing the importance of addressing issues related to academic integrity and responsible AI use (Baidoo-Anu & Owusu Ansah, 2023; Rajabi et al., 2023). The call for ethical guidelines aligns with broader discussions on AI ethics and the need for clear frameworks (Breeding et al., 2023; Farrokhnia et al., 2023). Participants highlighted plagiarism, authorship ambiguity, and data privacy as key ethical challenges, revealing a lack of consistent institutional guidance.

Moreover, educators reported that both teachers and students lack awareness of data security risks, with some entering personal information into ChatGPT without understanding the implications. The findings reflect a pressing need for ethical literacy across all educational levels. Without explicit policy frameworks, academic institutions risk both misconduct and reputational harm.

To ensure responsible integration, institutions should establish comprehensive AI ethics policies encompassing authorship citation, data privacy, and responsible usage. These policies must be coupled with ethics training modules for teachers and students, embedding discussions

of integrity into curricula. Additionally, collaboration with technology developers can promote transparent data governance systems aligned with institutional and national standards for educational technology.

Theme 6: Digital divide

The concern about the digital divide and unequal access to ChatGPT resources reflects ongoing discussions on educational disparities exacerbated by technology (Alkhaqani, 2023; Sánchez-Ruiz et al., 2023; Wardat et al., 2023). Respondents emphasized that infrastructure deficits, unstable internet, limited devices, and inconsistent electricity, impede equitable AI integration. The emphasis on equitable resource allocation aligns with calls for inclusive technology policies in education (Perera & Lankathilaka, 2023; Wardat et al., 2023).

This divide not only hinders innovation but also deepens learning inequities between urban and rural schools. Educators in digitally advanced environments gain exposure to new tools and practices, while those in marginalized areas remain isolated. Bridging this divide requires recognizing technological access as a matter of educational rights, not privilege.

To address these challenges, stakeholders should implement equity-oriented infrastructure initiatives, including subsidized internet for schools, shared digital labs, and public–private investment partnerships. In parallel, teacher training must incorporate low-resource digital pedagogy, equipping educators with adaptive strategies for offline or hybrid AI use. Policy frameworks should monitor digital inclusion indicators to ensure that technological progress translates into equitable educational outcomes.

Theme 7: Balancing human interaction

The preservation of human interaction in education resonates with previous research emphasizing the irreplaceable role of teachers in creating meaningful learning experiences (Bishop, 2023; Sharma et al., 2023). The call for balancing technology with personal touch aligns with discussions on the importance of socio-emotional aspects of learning (Kung et al., 2023; Malik et al., 2023; Sallam, 2023). Educators in this study reaffirmed that while ChatGPT can streamline instruction, it cannot replicate empathy, compassion, or emotional presence, which are the foundations of human connection in learning.

Participants described ChatGPT as a useful assistant but warned that excessive reliance could depersonalize communication and weaken trust. Nonetheless, some educators highlighted that using AI strategically, such as automating grading, creates more time for mentoring and individualized feedback. The findings underscore the importance of balancing technological integration with human-centered pedagogy that values both efficiency and empathy.

To operationalize this balance, teacher training should include emotional intelligence and digital empathy modules. Institutional policy must safeguard teacher–student interaction time even in AI-enhanced environments. Furthermore, school leaders should promote hybrid learning models that integrate AI without undermining personal relationships, ensuring that human connection remains the core of educational practice.

Theme 8: Depersonalization of education

Concerns about the potential depersonalization of education due to excessive AI use align with discussions on maintaining the human aspect of teaching (Currie et al., 2023; Kung et al., 2023). The emphasis on emotional and social aspects of learning resonates with research highlighting the role of affective factors in education (Bitzenbauer, 2023). Educators observed that prolonged reliance on ChatGPT risks reducing education to an impersonal exchange of information.

However, others emphasized that when used mindfully, ChatGPT can restore personal engagement by automating repetitive tasks and freeing teachers to focus on mentoring. This duality illustrates that depersonalization is not an inherent feature of AI but a function of how it is integrated. Pedagogical design, institutional norms, and teacher attitudes ultimately determine whether technology amplifies or undermines relational learning.

As a practical measure, institutions should establish AI-use boundaries that prioritize student engagement and collaboration. Teacher evaluation frameworks could include indicators of relational pedagogy, ensuring that technological adoption does not diminish interpersonal quality. Encouraging reflective teaching practices, peer observation, and student feedback can further ensure that AI integration strengthens, rather than erodes, the human essence of education.

Theme 9: Continual adaptation

The theme of continual adaptation aligns with the broader discourse on the evolving role of AI in education (Gilson et al., 2023; Rusandi et al., 2023; Zamfiroiu et al., 2023). The emphasis on staying informed and proactive reflects the dynamic nature of AI technologies (Uddin et al., 2023). Participants consistently emphasized that effective use of ChatGPT requires ongoing learning, experimentation, and reflection. Teachers viewed adaptation not only as a technical skill but as a mindset essential for sustained innovation.

Nonetheless, most participants noted a lack of institutional structures to support continual learning. Informal peer exchanges and self-directed exploration remain the main modes of adaptation, which risks creating inconsistencies in AI competence across educators. Systemic frameworks for professional growth are therefore vital to institutionalize adaptation and prevent disparities in digital readiness.

Educational leaders should implement tiered AI competency frameworks within CPD programs, differentiating between beginner, intermediate, and advanced users. Creating communities of practice where educators share strategies and reflections will sustain collective learning. Policy reforms should also embed AI literacy benchmarks within teacher evaluation systems, ensuring that adaptation is recognized, supported, and rewarded institutionally.

CONCLUSION

The introduction of ChatGPT into education has sparked complex discourse among East Kalimantan educators, revealing both transformative potential and significant challenges. This study identifies ChatGPT as a catalyst for innovation through personalized learning, an enhancer of accessibility by breaking linguistic barriers, and a source of efficiency by automating administrative tasks. However, these benefits are tempered by concerns regarding its impact on critical thinking, ethical dilemmas such as plagiarism, the digital divide, depersonalization of learning, and the need to preserve human interaction. These findings underscore the necessity for a balanced and cautious approach to AI integration. While ChatGPT aligns with broader goals of creating dynamic, inclusive learning environments, its implementation must address ethical and pedagogical concerns to ensure equity and responsibility.

This study acknowledges limitations, including its qualitative design, small sample size, and reliance on perceptions rather than measured outcomes. Future research should employ larger, diverse samples and longitudinal designs to assess ChatGPT's actual impact on learning. Further investigation is also needed to develop ethical guidelines, effective pedagogical strategies, and sustainable implementation models. In summary, this research illuminates ChatGPT's dual role as both an innovative tool and a source of disruption, emphasizing that proactive, informed strategies are essential to harness its benefits while mitigating risks in educational practice.

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