**Perceptions and Challenges: A Qualitative Inquiry of Elementary Teachers' Experiences with AI-Powered Tools in DepEd Dingras District I**

**Abstract:** This qualitative case study explores how elementary teachers in the DepEd Dingras District I adopt AI-powered tools, examining their experiences, challenges, and perceptions. The study seeks to answer the following questions: (1) How do teachers discover, learn, and integrate AI tools into daily instruction? (2) What technical, pedagogical, and systemic barriers do they face? (3) How do teachers perceive AI’s role in improving teaching efficiency and student engagement compared to traditional methods? Using purposive and snowball sampling, 10 teachers with AI experience were selected to answer semi-structured questionnaires using Google Forms until thematic saturation was achieved. The findings systematically address each research objective: First, regarding AI integration (Question 1), teachers reported peer-driven discovery processes and gradual adoption through user-friendly tools (P1, P8), while developing hybrid implementation strategies that combine AI-assisted preparation (e.g., automated quiz generation [P5]) with traditional delivery methods (Boumediene & Bouakkaz, 2024). Second, analysis of barriers (Question 2) revealed technological intimidation (Mastul et al., 2023), infrastructure limitations (P9), and privacy concerns (Berg, 2024) compounded by insufficient institutional support (Estrellado & Miranda, 2023). Third, on AI's perceived impact (Question 3), participants acknowledged significant efficiency gains through task automation (Vetrivel et al., 2024) and enhanced engagement via gamification (Delello et al., 2024), yet maintained cautious optimism by employing mitigation strategies against over-reliance (Taşkın, 2025).

This research holds critical implications for educational technology and AI-powered tools integration, particularly in resource-constrained settings. By documenting teacher experiences in a public school system, it addresses gaps in the literature on AI-powered tools adoption in Global South classrooms and offers actionable insights for balancing innovation with equity. The study concludes that successful AI-powered tools integration requires a multi-level approach—phased teacher training, infrastructure upgrades, and policy frameworks for ethical implementation. Recommendations include competency-based professional development, equitable resource allocation, and pilot testing in Dingras District I to refine scalable solutions. This research contributes to understanding AI-powered tools adoption in Philippine public elementary schools, bridging theory and practice while preserving pedagogical integrity.

**Keywords:** AI-powered tools Adoption in Education, Teacher Technology Integration, Barriers to AI Implementation

INTRODUCTION

Elementary teachers are increasingly adopting AI-powered tools to enhance pedagogy, streamline administrative tasks, and promote equitable learning. The primary drivers include efficiency gains through automated grading and lesson planning (Darmawan et al., 2024; Sugiarso et al., 2024), personalized learning via adaptive AI-powered tools (Ruslim & Khalid, 2024), and support for hybrid education models through interactive platforms (Клєба et al., 2024). Institutional training programs have proven crucial for successful implementation, boosting teacher confidence in AI-powered tools' utilization (He & Chung, 2024). However, ethical concerns regarding data privacy, algorithmic bias, and technological over-reliance present ongoing challenges (Yumbul & Sulak, 2024).

In classroom applications, AI-powered tools demonstrate transformative potential across multiple domains. AI lesson planning tools like ChatGPT and MagicSchool generate customized content while reducing preparation time (Kiryakova, 2024). AI-powered tools used in assessment employing neural networks automate grading with high objectivity (Liu, 2024), and platforms like Quizizz enhance digital literacy (Andriani et al., 2023). AI-powered tools used in classroom management tools analyze student behavior to optimize learning environments (Kim & Kim, 2024), while interactive applications foster engagement through adaptive content (Bansal, 2023; Saputra et al., 2024). However, global adoption varies significantly, with developing nations facing infrastructure limitations and training deficits that hinder implementation (Lubis et al., 2024).

The integration of AI-powered tools in rural and underserved schools encounters multifaceted barriers. Infrastructure challenges, including unreliable internet connectivity and inadequate hardware, persist (Lubis et al., 2024; Xu, 2024), compounded by cultural mismatches between AI systems and local educational contexts (Singh & Jindal, 2024). Teacher apprehension stemming from insufficient training further slows adoption (Souza et al., 2024), while policy gaps perpetuate inequitable access ("Leveraging AI To Bridge Educational Inequities," 2024). Successful case studies, such as Brazil's nationwide AI education initiative (Isotani et al., 2023), demonstrate that targeted investments and public-private partnerships can overcome these obstacles.

Empirical evidence highlights AI's positive impact on educational outcomes. Teachers benefit from reduced administrative burdens and enhanced instructional capabilities (Joel et al., 2024), while students show improved academic performance through personalized learning systems (Annuš & Kmeť, 2024). AI-powered tools have proven particularly effective in STEM education, with adaptive platforms boosting math proficiency (Pramukawati et al., 2024), and in developing 21st-century skills through project-based applications (Aravantinos et al., 2024). Nevertheless, persistent challenges, including technological disparities (Kumar, 2024) and ethical concerns (Dubey, 2024), underscore the need for comprehensive policy frameworks.

To fully realize AI's educational potential, policymakers must prioritize three key areas: infrastructure development to ensure equitable access (Nasser, 2024), robust teacher training programs (Pramukawati et al., 2024), and ethical guidelines addressing data privacy and algorithmic transparency (Xiao et al., 2025). Strategic investments following models like India's collaborative funding approach (Singh & Jindal, 2024) can help bridge the digital divide while maintaining pedagogical quality. As AI continues to evolve, its thoughtful integration promises to transform elementary education, provided implementation addresses both technological capabilities and human factors.

*Statements of the Problem*

This study was conducted to answer the research titled “Perceptions and Challenges: Elementary Teachers' Experiences with AI-Powered Tools in DepEd Dingras District I – A Qualitative Inquiry”.

Specifically, it opts to answer the following questions:

1. How do elementary teachers in Dingras District I discover, learn, and integrate AI-powered

tools into their daily instruction?

2. Barriers that elementary teachers in Dingras face when using AI-powered tools:

a. technical;

b. pedagogical; and

c. systematic.

3. How do teachers view the role of AI-powered tools in improving their teaching efficiency

and student engagement compared to traditional methods?

*Theoretical Framework*

This study integrates four complementary theoretical perspectives to examine AI-powered tools’ adoption in Philippine elementary education. The Technology Acceptance Model (TAM) (Davis, 1989; Venkatesh & Davis, 2000) provides the foundational lens for analyzing teachers' perceived usefulness (e.g., time savings in assessment creation) and ease of use (e.g., tool accessibility) of AI-powered tools, which prior research identifies as critical adoption factors in educational contexts (Scherer et al., 2019). Complementing this Rogers, 2003), Diffusion of Innovations Theory helps explain systemic influences on adoption patterns, particularly how relative advantage and compatibility affect implementation in resource-constrained settings (Tømte et al., 2019) - a gap noted in recent Global South education studies (Sibug et al., 2024). The Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) operationalizes our analysis of instructional integration, building on evidence that effective edtech adoption requires balancing technological competence with pedagogical strategies (Willermark, 2018). Critical pedagogy (Freire, 1970) provides the ethical lens for examining power dynamics in AI implementation, addressing growing concerns about data privacy and algorithmic bias in educational technology (Berg, 2024; Williamson et al., 2023).

Methodologically, this study applied Braun and Clarke's (2006) reflexive thematic analysis with explicit theory-coding linkages. First-cycle deductive coding identified TAM constructs (perceived usefulness/barriers) and Rogers' innovation attributes (trialability, observability), while second-cycle inductive analysis revealed emergent TPACK patterns (pedagogical adaptations) and critical pedagogy themes (equity concerns). Following Lincoln and Guba's (1985) criteria for qualitative rigor, we ensured trustworthiness through member checking (Birt et al., 2016) and maintained audit trails documenting theory-findings connections. This approach extends recent work on teacher-AI integration (Nguyen et al., 2023) by revealing how educators navigate tensions between efficiency gains (per TAM) and ethical risks (per critical pedagogy) - a dynamic particularly salient in low-resource contexts (Selwyn, 2022). The resulting framework not only explains our Philippine case study findings but also contributes to theoretical conversations about culturally responsive edtech adoption (Trucano, 2021) in the Global South.

REVIEW OF RELATED LITERATURE

The adoption of AI-powered tools in Philippine public elementary schools faces barriers and facilitators. Teacher readiness is key, with educators showing openness to AI but needing professional development to enhance skills (Sibug et al., 2024). DepEd policies support AI integration but lack frameworks for ethics and equity (Estrellado & Miranda, 2023; Arriola-Mendoza & Ureña, 2024). Infrastructure gaps, including limited hardware and internet access, hinder implementation (Mastul et al., 2023; Rodrigo, 2021). Solutions include teacher training, policy improvements, and infrastructure investments (Evangelista et al., 2023; Pramukawati et al., 2024). Despite challenges, stakeholder collaboration can facilitate AI adoption.

The integration of Artificial Intelligence (AI) in elementary education has significantly transformed lesson planning, assessment, and classroom management, enabling personalized, efficient, and inclusive learning experiences. AI-powered tools enhance lesson planning by analyzing student data to create tailored learning paths and recommend resources, addressing individual needs and knowledge gaps (Silva et al., 2025; Mukti, 2023). Intelligent tutoring systems adapt lessons in real-time based on student performance, as seen in platforms like DreamBox, which personalizes math instruction (Sahito et al., 2024; Taşkın, 2025; Boumediene & Bouakkaz, 2024). Additionally, AI provides real-time insights into student engagement, helping teachers refine lesson plans dynamically (Delello et al., 2024; Rukadikar & Khandelwal, 2023). By automating administrative tasks, AI also improves teacher efficiency, allowing educators to focus on creative instruction (Sipahioğlu, 2024; Zhao, 2023).

In assessment, AI introduces automated grading, adaptive testing, and data-driven interventions. Tools like Quizizz use AI to score assignments and provide immediate feedback, reducing grading errors and ensuring consistency (Vetrivel et al., 2024; Andriani et al., 2023). Adaptive assessments adjust difficulty based on student responses, offering a more accurate evaluation of abilities (Khlaif, 2024; Rasheed et al., 2023). AI also identifies performance trends, enabling targeted interventions to address learning gaps (Delello et al., 2024; Taşkın, 2025). In classroom management, AI streamlines administrative tasks such as attendance tracking and parent communication, while chatbots and virtual assistants enhance engagement (Delello et al., 2024). Furthermore, AI supports inclusive education by offering adaptive resources for students with disabilities or language barriers (Chisom et al., 2024; Mahmoud & Sørensen, n.d.).

Despite its benefits, AI in education raises ethical concerns, including data privacy, algorithmic bias, and the digital divide. Protecting student data from misuse is critical (Boumediene & Bouakkaz, 2024; Berg, 2024), while addressing biases in AI algorithms ensures equitable treatment (Delello et al., 2024; Taşkın, 2025). Additionally, ensuring equitable access to AI-powered tools is necessary to prevent widening educational disparities (Chisom et al., 2024; Mahmoud & Sørensen, n.d.). These challenges must be addressed to fully harness AI’s potential in elementary education.

The integration of AI-powered tools in elementary education significantly enhances teacher efficiency and student engagement by facilitating personalized learning experiences. AI-powered tools, such as intelligent tutoring systems and automated grading, allow for tailored educational paths, real-time feedback, and reduced administrative burdens on teachers, thereby improving teaching effectiveness (Joel et al., 2024; Nasser, 2024). Studies indicate that these tools lead to increased student achievement and engagement, as they adapt to individual learning needs and provide immediate support (Sahito et al., 2024) (Mukti, 2023). However, challenges such as data privacy concerns, the digital divide, and the necessity for ongoing teacher training must be addressed to optimize AI's benefits (Nasser, 2024; Mukti, 2023). Furthermore, while AI can enhance initial student interest, there is a risk of dependency that may affect critical thinking and content retention, suggesting a need for a balanced approach in its application (Talgatov et al., 2024). Overall, AI-powered tools present a promising avenue for transforming educational practices in elementary schools, provided that equitable access and proper training are prioritized.

METHODOLOGY

*Research Design*

This study employs a qualitative case study approach (Yin, 2018) to explore how elementary teachers in DepEd Dingras District I navigate AI-powered tools in their instructional practices. The design is grounded in an interpretivist paradigm (Creswell & Poth, 2018), which prioritizes understanding participants' lived experiences and subjective meanings as they adopt AI-powered tools. Data were collected through semi-structured questionnaires (Brinkmann & Kvale, 2015) with 10 purposively sampled teachers who have firsthand experience using AI-powered tools like ChatGPT, Quillbot, Canva, adaptive learning platforms, or automated grading systems. Interviews will focus on three core themes aligned with the research questions: (1) discovery and integration processes, (2) technical/pedagogical/systemic barriers, and (3) perceived impacts on teaching efficiency and student engagement.

*Locale of the Study and Population Sampling*

This study focuses on elementary school teachers within the DepEd Dingras District I who have experience using AI-powered tools in their teaching practices. The research population includes public elementary teachers (Grades 1–6) who have actively integrated or experimented with AI-powered tools, such as ChatGPT, Quillbot, Canva, adaptive learning platforms, or AI-assisted lesson planning tools. To ensure diverse perspectives, both tech-savvy educators and those with limited experience in AI will be considered. Given the qualitative nature of this inquiry, the study will employ purposive sampling to select participants who can provide meaningful insights into how they navigate AI in education. Specifically, criterion sampling will be used to identify teachers who meet key requirements, such as current employment in DepEd Dingras District I and firsthand experience with AI-powered tools. Additionally, snowball sampling may help locate more participants through referrals, while data collection will continue until thematic saturation is achieved, ten (10) participants, to ensure depth and richness in the findings. This approach allows for an in-depth exploration of teachers' experiences, challenges, and adaptations in using AI, aligning with the study’s goal of understanding their journey beyond traditional teaching methods. If needed, adjustments can be made based on accessibility and participant availability.

*Instrumentation*

This study employs a semi-structured questionnaire as the primary data collection tool to explore how elementary teachers in DepEd Dingras District I navigate AI-powered tools in their instructional practices. The instrument consists of five core open-ended questions designed to elicit rich, detailed responses from the target population, public elementary teachers (Grades 1–6) who have experience using AI-powered tools such as ChatGPT, Quillbot, Canva, adaptive learning platforms, or automated grading systems.

*Data Gathering Procedure*

I.***Data Gathering Procedure***: I designed a semi-structured Google Forms questionnaire containing five open-ended questions exploring teachers' AI-powered tool discovery, integration methods, challenges, ethical considerations, and perceived impacts. The digital format ensured accessibility, while clear instructions and consent forms maintained ethical standards. Questions were sequenced logically from initial adoption to classroom implementation, with a mobile-friendly design for teacher convenience across devices.

***II. Ethical Distribution:*** The survey link was distributed through verified Messenger groups of DepEd Dingras teachers, accompanied by administrator-approved endorsement letters. Participation was voluntary, with informed consent embedded in the form. Personal networks and professional communities helped reach eligible respondents while maintaining confidentiality. Daily monitoring ensured proper dissemination without compromising respondent anonymity or data security protocols.

***III. Data Collection****:* Over two weeks, I collected responses with two reminder messages to improve participation. Ten submissions were received. The Google Forms platform automatically timestamps and organizes responses while protecting identities. Response monitoring allowed for immediate follow-up on unclear answers while maintaining the study's scheduled timeline and ethical boundaries.

**IV. Data Analysis:** Qualitative responses were exported to Microsoft Excel for thematic analysis using Braun & Clarke's framework. After anonymizing respondents (P1-P10), I coded emerging patterns about AI adoption barriers and benefits. Peer debriefing validated the coding structure, while member checking with three participants ensured accuracy. Negative cases were examined to strengthen the findings' credibility and depth.

***V. Ethical Compliance:*** All data collection followed institutional review guidelines, with encrypted storage and strict access controls. Participants could withdraw anytime, with no identifying information collected. Findings were reported anonymously, using direct quotes only with permission. The study maintained transparency about its limitations while providing teachers with summary results upon request to honor their contributions.

*Ethical Consideration*

This research study, "Perceptions and Challenges: Elementary Teachers' Experiences with AI-Powered Tools in DepEd Dingras District I – A Qualitative Inquiry," adheres to strict ethical guidelines to ensure participant rights and data integrity. Informed consent was obtained from all teacher-participants, with clear explanations of the study’s purpose, voluntary nature, and confidentiality measures. Anonymity was maintained by assigning codes (e.g., P1, P2) instead of using real names, and all collected data were stored securely in password-protected files to prevent unauthorized access. Transparency was prioritized by disclosing the study’s scope, potential risks (e.g., discussing technology frustrations), and benefits (e.g., contributing to AI integration strategies in education). Voluntary participation was emphasized, allowing respondents to withdraw at any time without repercussions. Additionally, ethical data usage was ensured by limiting analysis to the research objectives, avoiding misrepresentation, and obtaining permission before quoting responses. Finally, findings will be shared responsibly, avoiding stigmatization of schools or individuals while promoting constructive discussions on AI adoption in Philippine public education.

RESULTS AND DISCUSSION

*Perceived Benefits*

The research theme highlights how AI-powered tools significantly enhance teaching efficiency by reducing time spent on routine tasks while maintaining instructional quality (Zhao, 2023; Sipahioğlu, 2024).

Participants consistently reported that AI streamlines labor-intensive processes like assessment creation (Vetrivel et al., 2024), with one teacher noting the ability to generate multiple quiz variants in minutes rather than hours (P5). This time-saving advantage allows educators to reallocate effort toward personalized instruction (Silva et al., 2025), as evidenced by the need to adapt AI-generated materials to student levels (P5).

The perceived improvement in teaching effectiveness (P3) stems not only from reduced workload but also from AI's capacity to provide rapid access to diverse educational resources (P1) (Sahito et al., 2024). Importantly, teachers emphasized the accessibility of these tools, with even technologically modest educators finding them usable (P3) (Sibug et al., 2024).

*Benefits of Adopting AI*

Teachers report that AI significantly enhances student engagement through gamification (Delello et al., 2024), enabling interactive learning experiences that were previously time-prohibitive to create (P1, P10). The technology's capacity to automate labor-intensive tasks like assessment generation (P1, P7) and lesson planning (P3) creates substantial efficiency gains (Taşkın, 2025), allowing educators to reallocate time toward instructional refinement. Notably, participants employ a strategic hybrid approach (Boumediene & Bouakkaz, 2024), leveraging AI for preparatory work while maintaining traditional delivery methods when pedagogically appropriate (P5).

Beyond classroom applications, AI serves as a powerful professional development tool (Evangelista et al., 2023), evolving from basic content generation to sophisticated functions like curriculum alignment and research synthesis (P5, P9). The theme further reveals AI's growing role in data-driven instruction (Rasheed et al., 2023), particularly in personalizing learning materials and generating actionable feedback to inform teaching decisions (P3, P9).

*Adoption Requirements*

Participants identified basic digital literacy as a fundamental requirement (Sibug et al., 2024), with one teacher emphasizing that computer competence is non-negotiable for effective AI tool utilization (P4). This finding is compounded by expressed anxieties about technological transitions (Agonas et al., 2024), where educators report feeling overwhelmed when encountering unfamiliar systems (P5).

*Adoption Barriers*

Technological intimidation emerges as a significant challenge (Mastul et al., 2023), with teachers expressing discomfort when encountering unfamiliar systems (P9). Compounding this issue are severe time constraints from existing workloads that limit opportunities for experimentation (P10) (Rodrigo, 2021).

Privacy concerns regarding student data protection create additional hesitancy (P1) (Berg, 2024), while the lack of institutional support leaves educators to navigate AI implementation independently (P6) (Estrellado & Miranda, 2023). Reliability issues further undermine confidence (Delello et al., 2024), as irrelevant AI-generated content requires additional vetting (P2).

*Implementation Strategies*

Participants advocate for a gradual adoption process (Pramukawati et al., 2024), beginning with simple, user-friendly tools to build confidence and competence (P1). Teachers emphasize the value of peer networks as critical support systems (Evangelista et al., 2023), where colleagues provide informal training and troubleshooting assistance (P8).

Importantly, successful implementation requires careful alignment with existing curricular objectives (Silva et al., 2025), with educators recommending focused application of AI to complement rather than disrupt established teaching plans (P10).

*Identified Risks*

Participants express concerns about potential over-reliance (Berg, 2024), fearing excessive dependence on tools that may become unavailable during technical disruptions (P4, P10).

Accuracy issues emerge as another significant risk (Taşkın, 2025), with teachers wary of misinformation in AI-generated content (P6).

Privacy considerations further complicate adoption (Boumediene & Bouakkaz, 2024), as educators question how to protect sensitive student data when using these tools (P2).

*Mitigation Strategies*

Participants advocate using AI as a supplementary rather than primary resource (P8) (Delello et al., 2024), maintaining human oversight of instructional content.

Teachers simultaneously emphasize preserving critical thinking development by limiting over-reliance on automated solutions (P1) (Taşkın, 2025).

These approaches demonstrate educators' cautious balancing of technological efficiency with pedagogical integrity (Chisom et al., 2024).

CONCLUSION AND RECOMMENDATIONS

*Conclusion*

This qualitative study explored the adoption of AI-powered tools among elementary teachers in DepEd Dingras District I. The findings confirm that AI enhances teaching efficiency by automating administrative tasks, personalizing instruction, and improving student engagement—echoing prior research on AI’s transformative potential in lesson planning and assessment (Silva et al., 2025; Sahito et al., 2024). However, the study also highlights persistent barriers, including technological intimidation, time constraints, and privacy concerns, which mirror broader challenges identified in Philippine public schools (Mastul et al., 2023; Estrellado & Miranda, 2023). Teachers’ cautious yet strategic integration of AI—using hybrid approaches and peer collaboration, reflects the literature’s emphasis on gradual adoption and professional development (Evangelista et al., 2023; Pramukawati et al., 2024). Despite AI’s benefits, participants raised ethical and pedagogical risks, such as over-reliance and data privacy, reinforcing concerns in global studies (Berg, 2024; Delello et al., 2024). Ultimately, this study underscores the need for structured training, institutional support, and policy frameworks to optimize AI adoption, ensuring that technological advancements align with equitable and effective pedagogy in Philippine elementary education.

The findings underscore the necessity for comprehensive teacher training programs, institutional infrastructure upgrades, and clear policy guidelines to facilitate sustainable AI integration in Philippine elementary schools. Structured professional development should address both technical competencies and pedagogical strategies for AI use, while schools require improved digital resources and technical support to mitigate accessibility gaps. At the policy level, the Department of Education must establish frameworks for ethical AI implementation, including data privacy protocols and equitable access measures, to ensure these technologies enhance rather than exacerbate educational disparities. Only through this multi-level approach—combining capacity-building, resource allocation, and governance—can AI-powered tools be effectively harnessed to transform teaching practices while safeguarding educational quality and inclusivity in public elementary education.

*Recommendations*

To maximize the benefits of AI while addressing identified challenges, a three-pronged implementation strategy is recommended. First, DepEd should develop a phased, competency-based teacher training program that progresses from basic digital literacy to advanced AI integration techniques, incorporating peer mentoring systems to sustain adoption. Second, infrastructure improvements must prioritize reliable internet connectivity and provision of AI-compatible devices, with targeted funding for underserved schools to prevent digital divides. Finally, policy reforms should establish clear guidelines on ethical AI use, including standardized data privacy measures and quality control protocols for AI-generated educational materials. These interventions should be piloted in Dingras District I as a model for scalable implementation, with continuous feedback mechanisms to refine approaches based on teacher experiences and student outcomes. This balanced framework ensures AI adoption enhances pedagogical effectiveness while mitigating risks associated with technological integration in resource-constrained educational settings.

**Ethical Approval:**

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

**Consent:**

Written informed consent was obtained from all teacher-participants.

**Disclaimer (Artificial intelligence)**

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

REFERENCES

Agonas, A., & Sibug, M. (2024). Teacher readiness and AI adoption in Philippine public elementary schools. *ERIC*. <https://files.eric.ed.gov/fulltext/EJ1447514.pdf>

Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member checking: A tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research, 26*(13), 1802–1811. <https://doi.org/10.1177/1049732316654870>

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health, 11*(4), 589–597. <https://doi.org/10.1080/2159676X.2019.1628806>

Darmawan, et al. (2024). [Full citation details needed.]

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340. <https://doi.org/10.2307/249008>

Freire, P. (1970). *Pedagogy of the oppressed* (M. B. Ramos, Trans.). Continuum. (Original work published 1970)

Giroux, H. A. (2020). *Critical pedagogy in uncertain times: Hope and possibilities*. Bloomsbury Academic.

He, H. (2024). *Flexible working arrangements and gender equality in Europe*. Publications Office of the European Union.

Lacuna, J. R. (2025). Exploring the readiness of pre-service teachers for AI integration in Philippine education. *International Journal of Research in Social Sciences and Interdisciplinary Studies, 4*(5), 4907–4924. <https://doi.org/10.47772/IJRISS.2025.90300392>

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage Publications.

Miller, R. L. (2018). Rogers’ innovation diffusion theory (1962, 1995). In *Encyclopedia of Information Science and Technology* (4th ed., pp. 1558–1567). IGI Global. <https://doi.org/10.4018/978-1-5225-5201-7.ch073>

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054.

Mulaik, S. A., et al. (1989). Evaluation of goodness-of-fit indices for structural equation models. *Psychological Bulletin, 105*(3), 430–445. <https://doi.org/10.1037/0033-2909.105.3.430>

Muslimin, A. I., et al. (2022). The effect of technology-based instruction lesson plan on EFL pre-service teachers’ TPACK self-efficacy. *World Journal of English Language, 12*(6), 304–314. <https://doi.org/10.5430/wjel.v12n6p304>

Nazaretsky, T., et al. (2022). Teachers’ trust in AI-powered educational technology and a professional development program to improve it. *British Journal of Educational Technology, 53*(4), 914–931. <https://doi.org/10.1111/bjet.13232>

Nguyen, T. N. T., et al. (2024). Artificial intelligence (AI) in education: A case study on ChatGPT’s influence on student learning behaviors. *Educational Process: International Journal, 13*(2), 105–121. <https://doi.org/10.22521/edupij.2024.132.7>

Nguyen, T., et al. (2023). [Full citation details needed.]

Ning, Y., et al. (2024). Teachers’ AI-TPACK: Exploring the relationship between knowledge elements. *Sustainability, 16*(3), Article 978. <https://doi.org/10.3390/su16030978>

Nyaaba, M., et al. (2023). Pre-service teachers’ knowledge, gender use, and views about generative AI in academic research [Preprint]. *Research Square*. <https://doi.org/10.21203/rs.3.rs-3640721/v1>

Oddone, K., et al. (2023). From books to bots. In C. Stang & J. Branch-Mueller (Eds.), *2023 IASL Annual Conference Proceedings*. <https://doi.org/10.29173/iasl8740>

Özen, E., & Özkara, F. C. (2023). Investigation of online education readiness of teachers involved in entwinning quality processes. *Anadolu Üniversitesi Sosyal Bilimler Dergisi, 23*(3), 873–898. <https://doi.org/10.18037/ausbd.1260405>

Özsayın, S. K. (2023). Integration ethics in special education program. *Route Educational and Social Science Journal, 83*, 177–184. <https://doi.org/10.17121/ressjournal.3502>

Padmavathi, M. (2017). Preparing teachers for technology-based teaching-learning using TPACK. *I-Manager’s Journal on School Educational Technology, 12*(3). <https://doi.org/10.26634/jsch.12.3.10384>

Polat, E., et al. (2022). Are K–12 teachers ready for e-learning? *The International Review of Research in Open and Distributed Learning, 23*(2), 214–241. <https://doi.org/10.19173/irrodl.v23i2.6082>

Rafiq, K. R. M., et al. (2022). Re-envisioning technological pedagogical content knowledge and online teaching readiness. *Frontiers in Psychology, 13*, Article 927835. <https://doi.org/10.3389/fpsyg.2022.927835>

Ramirez, E. A. B., & Fuentes Esparrell, J. A. (2024). Artificial intelligence (AI) in education: Unlocking the perfect synergy for learning. *Educational Process: International Journal, 13*(1), 35–51. <https://doi.org/10.22521/edupij.2024.131.3>

Rohmitawati, R. (2018). The implementation of TPACK framework on Indonesian online mathematics teachers training. *Southeast Asian Mathematics Education Journal, 8*(1), 61–68. <https://doi.org/10.46517/seamej.v8i1.64>

Russell, R. G., et al. (2022). Competencies for the use of artificial intelligence–based tools by health care professionals. *Academic Medicine, 98*(3), 348–356. <https://doi.org/10.1097/acm.0000000000004963>

Santos, J. M., & De Regla Castro, R. (2020). Technological pedagogical content knowledge (TPACK) in action. *Social Sciences & Humanities Open, 3*(1), Article 100110. <https://doi.org/10.1016/j.ssaho.2021.100110>

Schmid, M., et al. (2020). Developing a short assessment instrument for technological pedagogical content knowledge (TPACK.xs). *Computers & Education, 157*, Article 103967. <https://doi.org/10.1016/j.compedu.2020.103967>

Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers’ adoption of digital technology in education. *Computers & Education, 128*, 13–35. <https://doi.org/10.1016/j.compedu.2018.09.009>

Selwyn, N. (2022). *Education and technology: Key issues and debates* (3rd ed.). Bloomsbury Academic.

Sibug, K. P., et al. (2024). [Full citation details needed.]

Tiba, C., & Condy, J. L. (2021). Identifying factors influencing pre-service teacher readiness to use technology. *International Journal of Information and Communication Technology Education, 17*(2), 149–161. <https://doi.org/10.4018/ijicte.20210401.oa2>

Tømte, C. E., et al. (2019). [Full citation details needed.]

Tordu, A. (2020). How COVID-19 has pushed us into a medical education revolution. *Internal Medicine Journal, 50*(9), 1150–1153. <https://doi.org/10.1111/imj.14882>

Trucano, M. (2021). Culturally responsive edtech adoption in the Global South. [Publication details needed.]

Tülübaş, T., et al. (2023). An interview with ChatGPT on emergency remote teaching: A comparative analysis based on human–AI collaboration. *Educational Process: International Journal, 12*(2), 93–110. <https://doi.org/10.22521/edupij.2023.122.6>

UNESCO. (n.d.). Artificial intelligence in education. <https://www.unesco.org/en/digital-education/artificial-intelligence>

Valtonen, T., et al. (2017). TPACK updated to measure pre-service teachers’ twenty-first century skills. *Australasian Journal of Educational Technology, 33*(3), 15–31. <https://doi.org/10.14742/ajet.3518>

Valtonen, T., et al. (2020). Fresh perspectives on TPACK: Pre-service teachers’ appraisal of their TPACK areas. *Education and Information Technologies, 25*(4), 2823–2842. <https://doi.org/10.1007/s10639-019-10092-4>

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Management Science, 46*(2), 186–204. <https://doi.org/10.1287/mnsc.46.2.186.11926>

Widodo, N. A. S., & Hidayati, Y. M. (2023). Analysis of technological pedagogical content knowledge of elementary school lesson plans. In *Proceedings of the International Conference on Learning and Advanced Education (ICOLAE 2022)* (pp. 1585–1591). <https://doi.org/10.2991/978-2-38476-086-2_126>

Willermark, S. (2017). Technological pedagogical and content knowledge: A review of empirical studies. *Journal of Educational Computing Research, 56*(3), 315–343. <https://doi.org/10.1177/0735633117713114>

Willermark, S. (2018). Technological pedagogical content knowledge: A review of empirical studies published from 2011 to 2016. *Journal of Educational Computing Research, 56*(7), 1067–1093. <https://doi.org/10.1177/0735633117748410>

Williamson, B., Eynon, R., & Potter, J. (2023). Education, datafication and algorithmic bias: Ethical challenges and policy responses. *Learning, Media and Technology, 48*(1), 1–15. <https://doi.org/10.1080/17439884.2023.2171234>

Wilson, J., et al. (2021). Elementary teachers’ perceptions of automated feedback and automated scoring. *Computers & Education, 168*, Article 104208. <https://doi.org/10.1016/j.compedu.2021.104208>

Wang, W., et al. (2018). Preservice teachers’ TPACK development: A review of literature. *Journal of Digital Learning in Teacher Education, 34*(4), 234–258. <https://doi.org/10.1080/21532974.2018.1498039>

Xu, W., & Ouyang, F. (2022). The application of AI technologies in STEM education: A systematic review. *International Journal of STEM Education, 9*(1), Article 59. <https://doi.org/10.1186/s40594-022-00377-5>

Yıkmış, G., & Akbıyık, M. (2022). An investigation of studies on professional ethics conducted with pre-service teachers in Turkey. *Cypriot Journal of Educational Sciences, 17*(9), 3303–3313. <https://doi.org/10.18844/cjes.v17i9.7562>

Yumbul, E., & Sulak, S. E. (2024). Examining the views of primary school teachers on the use of artificial intelligence in education. *Education Mind, 3*(3), 303–317. <https://doi.org/10.58583/EM.3.3.2>

Zulkarnain, N. S., & Yunus, M. M. (2023). Primary teachers’ perspectives on using artificial intelligence technology in English as a second language teaching and learning: A systematic review. *International Journal of Academic Research in Progressive Education and Development, 12*(2), 812–825. <https://doi.org/10.6007/IJARPED/v12-i2/17119>