International Journal of Educational Innovation and Research ISSN: 2810-0808
Volume 4, Number 2, 2025, pp 270-279
DOI: https://doi.org/10.31949/ijeir.v4i2.15174

Exploring the Role of Generative AI in Enhancing Productivity in Indonesia's Public TVET Institutions

Reza Fajarsyah[1,2]*
[1]Global TVET Management, Industrial Management Department, Korea University of Technology and Education, Cheonan, Republic of Korea
[2]Directorate General of Vocational Training and Productivity Development, Ministry of Manpower of the Republic of Indonesia, Jakarta, Indonesia
*Corresponding Author: freza13@koreatech.ac.kr

ABSTRACT
This study investigates the perceptions, experiences, and challenges of adopting Generative Artificial Intelligence (GenAI) in enhancing work productivity within public Technical and Vocational Education and Training (TVET) institutions in Indonesia. Employing a qualitative research design, semi-structured interviews were conducted with twenty participants, including ten instructors and ten administrative staff from various public TVET institutions. Thematic analysis was used to interpret the data, identifying key themes related to GenAI's benefits, obstacles, and institutional support needs. Findings reveal generally positive attitudes toward GenAI's potential to improve instructional and administrative tasks, with early adopters reporting notable efficiency gains and enriched educational content. However, significant barriers such as infrastructural limitations, uneven digital literacy, concerns about content accuracy, ethical considerations, and a lack of formal training and policies hinder wider adoption. Institutional support, including comprehensive training, clear ethical guidelines, improved digital infrastructure, and strong leadership commitment, is critical to facilitating effective integration. The results underscore the importance of a holistic approach addressing technological, human, and organizational factors to maximize GenAI's benefits in public TVET contexts. This study contributes empirical insights into AI adoption in vocational education in a developing country, advancing the discourse on digital transformation in this sector. Implications for policy and practice include targeted capacity-building programs and infrastructural investments. Future research is recommended to measure productivity impacts quantitatively and to explore learner perspectives, along with longitudinal studies to assess long-term adoption.

ARTICLE HISTORY
Received yyyy-mm-dd
Accepted yyyy-mm-dd

KEYWORDS
Generative AI
Productivity
TVET
Public TVET
Perception

INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) has triggered transformative changes across multiple sectors, including education and workforce development (Russell & Norvig, 2021). One of the most disruptive subfields is Generative Artificial Intelligence (GenAI), a technology capable of autonomously producing new content such as text, images, and videos based on large-scale data learning (Dhamani, 2024). In the context of public Technical and Vocational Education and Training (TVET) institutions, GenAI holds promise for improving

work productivity by automating administrative work, facilitating lesson and curriculum planning, and supporting personalized instruction (Künnap, 2025; Omeh et al., 2025; Zahri et al., 2023). These capabilities are especially relevant given the institutional mandate of public TVET providers to deliver inclusive and affordable workforce training under often limited resources (UNESCO, 2016, 2021).

Recent studies have explored the role of AI in enhancing education and workplace efficiency. In general education, AI is being used to personalize learning pathways, provide automatic feedback, and support decision-making processes (Baidoo-Anu & Ansah, 2023; Deckker & Sumanasekara, 2025; George, 2023). GenAI applications such as ChatGPT, Gemini, and Copilot can assist teachers by generating instructional content and simulations with increased flexibility and creativity (Sahu, 2024). In the broader TVET context, GenAI has shown potential to enhance training relevance and delivery efficiency by streamlining administrative tasks and aligning educational content with labor market demands (Pan & Filippova, 2024).

However, despite this emerging potential, the integration of GenAI in public TVET institutions remains limited and uneven. This slow uptake can be attributed to several interrelated factors: gaps in digital literacy among staff, lack of infrastructure, insufficient institutional support, and the absence of official guidelines on responsible AI use (Baharin et al., 2024; Ishrat et al., 2025). Additionally, educators and administrators express concerns about the reliability and ethical use of AI-generated content, as well as the risk of overdependence on technology in the learning process (Baidoo-Anu & Ansah, 2023; Omeh et al., 2025; Zlotnikova et al., 2025). Current studies have primarily focused on general education or high-resource settings, leaving a paucity of empirical evidence on how GenAI tools are perceived and utilized in public vocational institutions.

This study addresses the empirical and theoretical gap by examining the perceptions, experiences, and challenges instructors and training staff face within Indonesia's public TVET sector regarding GenAI adoption. While existing literature identifies GenAI's functionality and potential benefits, few studies provide qualitative insights into the real-world contexts in which these tools are implemented, especially in under-resourced public training institutions. As TVET systems globally are expected to produce competent, productive, and adaptable workers (UNESCO, 2021), understanding how emerging technologies like GenAI can support this mission is timely and critical. This research extends prior studies by focusing on how GenAI affects institutional work productivity, broadly defined as the effectiveness in achieving work-related goals (M. Rogers & Rogers, 1998), encompassing both instructional quality and administrative efficiency (UNESCO, 2016).

Guided by this research gap, the present study aims to generate empirical insights into GenAI adoption from the perspectives of public TVET instructors and administrative personnel. Specifically, the study investigates three main questions. First (1), how do instructors and training staff in public TVET institutions perceive the use of Generative AI in their professional activities? Second (2), in what ways does Generative AI facilitate or hinder productivity in the public TVET context? Third (3), what challenges and institutional support arise as barriers or enablers to adopting GenAI tools in public TVET institutions?

The study adopts a qualitative methodology to answer these questions. It uses semi-structured interviews with twenty participants, comprising ten instructors and ten administrative staff from various public TVET institutions in Indonesia. Thematic analysis is employed to identify key patterns related to perceived benefits, practical barriers, and institutional support mechanisms.

The novelty of this research lies in its context-specific focus on the Indonesian public TVET sector, which is often underrepresented in global AI and education discourse. This study contributes to the growing literature on digital transformation in vocational education by combining empirical evidence with theoretical reflection. It provides actionable insights for policymakers, educational leaders, and technology developers seeking to integrate GenAI responsibly and effectively.

METHODS

This study employed a qualitative research design to investigate how Generative Artificial Intelligence (GenAI) supports work productivity within public Technical and Vocational Education and Training (TVET) institutions in Indonesia. The qualitative approach was considered appropriate for capturing rich, contextual insights into the lived experiences, perceptions, and attitudes of professionals in the TVET sector, particularly about emerging technologies like GenAI (Lim, 2025; Tracy, 2024). Twenty participants were selected through purposive sampling, comprising ten instructors and ten administrative staff members from public TVET institutions across several provinces in Indonesia. This composition was intentionally chosen to capture perspectives from both instructional and administrative roles, which are integral to the daily operations of vocational institutions. Participants were selected based on their familiarity with GenAI tools or involvement in job functions where such tools could be applied. The participant profiles are presented in Table 1, which includes their role, institution region, and years of professional experience.

Table 1. Participant Profile

Participant ID	Role	Institution Region	Years of Experience
Ins1	Instructor	North Sumatra	4
Ins2	Instructor	North Sumatra	6
Ins3	Instructor	West Java	12
Ins4	Instructor	South Sulawesi	7
Ins5	Instructor	South Sulawesi	7
Ins6	Instructor	South Sulawesi	6
Ins7	Instructor	Papua	7
Ins8	Instructor	Banten	8
Ins9	Instructor	Banten	6
Ins10	Instructor	Banten	5
Adm1	Admin Staff	North Sumatra	8
Adm2	Admin Staff	North Sumatra	6
Adm3	Admin Staff	West Java	8
Adm4	Admin Staff	West Java	6
Adm5	Admin Staff	South Sulawesi	4
Adm6	Admin Staff	Papua	3
Adm7	Admin Staff	Banten	3
Adm8	Admin Staff	Banten	4
Adm9	Admin Staff	Banten	6
Adm10	Admin Staff	Banten	7

Data were collected through semi-structured interviews, conducted either face-to-face or via online platforms, depending on participants' availability and location. The interview protocol consisted of open-ended questions developed to explore several core areas: participants' understanding of and experience with GenAI tools, the perceived influence of GenAI on their work productivity, challenges faced in adopting such technologies, and the types of institutional support considered necessary for effective integration. The semi-structured format allowed for consistency across interviews while also offering flexibility to explore emerging themes in depth.

In terms of data analysis, a thematic analysis technique was employed. The interview transcripts were carefully reviewed, coded, and organized into themes and subthemes relevant to the research questions. The process involved several steps: initial familiarization with the data, generation of initial codes, identification of recurring patterns, and developing thematic categories. This method systematically analyzed qualitative data and derived key insights from the participants' narratives.

All ethical procedures were followed throughout the research process. All respondents provided informed consent before participation, including consent for audio recording when applicable. Participants were assured that their responses would remain confidential and would be used solely for academic purposes. Anonymity was maintained in all stages of data handling and reporting. Participants were also informed of their right to withdraw from the study at any point without penalty. This methodological approach ensured that the study design aligned with the research objectives, allowed for a deep understanding of the phenomenon under investigation, and maintained the ethical standards for conducting qualitative research in educational contexts.

RESULTS AND DISCUSSION

Result

Positive Perceptions and Early Adoption of Generative AI

Most participants expressed favorable attitudes toward the potential of Generative Artificial Intelligence (GenAI) to enhance work productivity. Instructors reported that tools such as ChatGPT significantly aided in developing instructional materials. For instance, one instructor shared, "I often use ChatGPT to help create practice questions. It saves much time and makes the content more varied" (Ins3). This illustrates a growing recognition of GenAI's capability to complement traditional pedagogical practices by expediting content creation.

Administrative staff also acknowledged GenAI's usefulness in streamlining daily administrative tasks. As one staff member explained, "Using AI tools to draft reports has reduced my workload significantly. I can focus more on other important tasks" (Adm7). This shift from manual and repetitive work to more strategic and value-added tasks was particularly beneficial, especially in resource-limited public institutions.

Several respondents also expressed optimism that integrating GenAI could foster a more innovative work environment. One instructor remarked, "By delegating routine tasks to AI, I can dedicate more time to developing new teaching strategies and improving student engagement" (Ins6). This perspective aligns with existing scholarship suggesting that AI technologies can catalyze creativity and pedagogical innovation (Baidoo-Anu & Ansah, 2023; Sahu, 2024).

Importantly, participants emphasized the need to frame AI as a collaborative tool rather than a substitute for professional expertise. As noted by one staff member, "AI helps me do things faster, but it's not a substitute for my knowledge and judgment" (Adm2). This view reflects a mature understanding that AI should augment rather than replace human capabilities.

Limited and Uneven Usage

Although perceptions of GenAI were generally positive, actual usage among participants varied considerably. Several individuals reported minimal or no direct use of AI tools due to limited access or lack of familiarity. As one staff member explained, "*I have heard about AI tools but have not used them because I don't have a reliable internet connection at work*" (Adm4). This highlights infrastructural disparities that inhibit equitable access to digital tools.

Similarly, some participants expressed uncertainty about how to effectively integrate GenAI into their daily responsibilities. One instructor stated, "*I am interested in AI but unsure how to start using GenAI effectively in my daily tasks*" (Ins9). This reflects a gap in institutional guidance and support for technology adoption.

Differences in digital literacy further contributed to uneven adoption. As one administrator noted, "*Some colleagues are very tech-savvy, but others struggle with basic computer skills, so AI adoption is uneven*" (Adm1). This disparity complicates efforts to achieve consistent productivity improvements across public TVET institutions.

The absence of adequate digital infrastructure was another recurring theme. One participant remarked, "Without proper devices and stable internet, it's hard to take full advantage of AI tools" (Ins5). Such

technological limitations reinforce existing systemic inequalities and hinder the modernization of instructional and administrative processes.

Moreover, the lack of formal orientation programs on GenAI is further restricted uptake. As one respondent noted, "*There is no official training or awareness program here; most of us learn by ourselves, which limits how many can really use AI effectively*" (Ins2). This points to the need for structured institutional interventions to support broader and more inclusive technology adoption.

Impact on Work Productivity

Participants who had successfully incorporated GenAI into their work routines reported significant productivity gains. One instructor noted, "*Generating quizzes and lesson outlines that used to take hours can now be done in a fraction of the time with AI assistance*" (Ins7). This reduction in task duration enabled staff to allocate more time to core pedagogical activities.

Administrative personnel echoed with similar experiences. As described by one staff member, "*Drafting training reports and official letters is faster and less stressful with AI drafts to start from*" (Adm6). The ability to generate initial text using AI alleviated cognitive load and accelerated the completion of administrative tasks.

Beyond efficiency, several participants perceived qualitative improvements in their outputs. For example, one instructor remarked, "*AI helps me come up with different question types and examples that make lessons more engaging for students*" (Ins4). These enhancements were viewed as contributing to improved instructional quality and learner engagement.

Participants consistently emphasized the necessity of human oversight. One instructor explained, "*I always review and adjust what the AI generates to ensure it fits my teaching style and the students' needs*" (Ins1). This collaborative approach between human and machine safeguarded professional standards and contextual relevance.

In addition, some respondents reported increased job satisfaction due to the reduced monotony of routine tasks. A staff member shared, "*Using AI has made my work more interesting; it reduces repetitive tasks and allows me to focus on problem-solving*" (Adm5). Thus, productivity gains were seen not only in terms of efficiency but also in the form of greater engagement and motivation.

Challenges and Concerns

Despite the positive outcomes, several challenges emerged. A key concern was the accuracy and reliability of AI-generated content. As one instructor warned, "*AI can produce mistakes or irrelevant information, so I always double-check everything it generates*" (Ins10). This underscores the limitations of current GenAI tools and the need for critical human oversight.

Apprehension about potential overreliance was also evident. An instructor noted, "*If we depend too much on AI, we risk losing our creativity and critical thinking skills*" (Ins8), while another participant stated, "*I worry AI might eventually replace some of our roles if we are not careful*" (Adm3). These sentiments reflect a tension between embracing innovation and preserving human-centered professionalism.

The absence of structured training is further complicated adoption. As one staff member stated, "*There is no official support or training on how to use AI properly, so many of us are unsure about ethical issues or best practices*" (Adm8). Without clear guidance, the risk of misuse or underutilization increases.

Privacy and data security were additional concerns. One participant commented, "*I am worried about data privacy when using AI tools, especially with sensitive student information*" (Ins3). This highlights the urgency of developing institutional policies to ensure ethical and secure AI use.

Lastly, some respondents pointed to psychological resistance to technological change. One instructor explained, "*Change is hard, especially when you do not fully understand the technology. Some colleagues resist using AI because it feels unfamiliar*" (Ins6). Overcoming this barrier requires sustained capacity-building and a supportive organizational culture.

Need for Institutional Support

Participants strongly agreed that institutional support is essential for effective GenAI integration. Comprehensive training was the most frequently mentioned need. One instructor stated, "*Proper training would help us understand AI better and use it more confidently and effectively*" (Ins5). This indicates a demand for systematic professional development.

Policy frameworks were also deemed necessary. A staff member emphasized, "*We need rules to ensure ethical use and protect data privacy, so everyone feels safe using AI tools*" (Adm7). Clear institutional policies would provide a foundation for responsible AI implementation.

Infrastructure upgrades were another priority. As one participant highlighted, "*Reliable internet and access to modern devices are necessary if we want to use AI tools effectively*" (Ins9). Technological readiness is a prerequisite for successful digital transformation.

Ongoing technical assistance was also requested. A staff member noted, "*Having someone to help troubleshoot problems or answer questions would encourage more staff to try using AI*" (Adm1). Providing accessible support channels could mitigate early-stage frustrations.

Finally, participants stressed the importance of leadership commitment. One instructor concluded, "*If institutional leaders prioritize AI integration and allocate resources, it will motivate staff to embrace these tools*" (Ins2). Top-down endorsement was seen as a critical enabler of cultural and procedural change.

Discussion

The findings of this study reveal a generally positive perception and early adoption of Generative Artificial Intelligence (GenAI) among instructors and administrative staff in public TVET institutions. Participants acknowledged GenAI's potential to enhance work productivity by automating repetitive tasks, enriching instructional materials, and supporting teaching innovation. This aligns with recent studies emphasizing the transformative capacity of GenAI to support personalized instruction, streamline content creation, and foster learner engagement (Mao, Chen, & Liu, 2024; Kadaruddin, 2023; Akanzire, Nyaaba, & Nabang, 2025). In vocational contexts, GenAI is also perceived as a strategic enabler in revitalizing instructional delivery and improving the relevance of training to labor market demands (Falaq, Nafi'a, & Damayanti, 2023; Thakur, Banerjee, & Sarkar, 2025). Moreover, broader scholarship underscores how GenAI in education is evolving from merely being a novel digital tool to a disruptive force in pedagogical design and assessment models (Alier, Peñalvo, & Camba, 2024; Williamson, Macgilchrist, & Potter, 2023). Teachers' positive attitudes toward GenAI are often associated with their digital competence and openness to experiment with emerging technologies in classroom settings (Galindo-Domínguez et al., 2024). These insights support prior arguments for enhancing TVET responsiveness and efficiency through advanced digital tools (Baidoo-Anu & Ansah, 2023; Deckker & Sumanasekara, 2025; Zahri et al., 2023; UNESCO, 2016).

However, despite such positive attitudes, GenAI usage remains limited and uneven. Participants reported several constraints, including a lack of infrastructure, low digital literacy, and the absence of formal training. These barriers mirror challenges reported in previous studies, which identify inadequate technological infrastructure, weak digital ecosystems, and insufficient capacity-building as major obstacles to AI adoption in vocational and technical education (Rongchang et al., 2024; Petridou & Lao, 2024; Kimutai et al., 2025; Zary & Zary, 2025). The issue of low digital literacy—particularly among educators and administrative personnel—further hampers the meaningful integration of GenAI tools, as highlighted by Peng and Yu (2022) in their comprehensive review of digital competence trends. Structural limitations such as legacy systems, outdated equipment, and lack of internet access also contribute to the slow and uneven uptake of AI technologies in TVET institutions (Blessing & Hubert, 2024; Okumu & Kenei, 2024). The digital divide observed here suggests that productivity gains from AI may not be equitably distributed across institutions, potentially exacerbating disparities within the TVET sector—especially in developing countries where institutional readiness and digital access remain uneven (Niwamanya et al., 2025; Tawfik, Reeves, & Stich, 2016).

Ethical and practical concerns were also highlighted, particularly regarding the reliability of AI-generated content, the fear of job displacement, and the risks of overreliance. These concerns reflect the need for responsible AI governance as emphasized by Omeh et al. (2025) and reinforce the importance of treating GenAI as a tool to complement rather than replace human expertise. Participants stressed the necessity of human oversight to ensure content quality and maintain educational integrity. Institutional support emerged as a critical moderator for GenAI adoption. Participants called for professional training, clear ethical guidelines, improved digital access, and stronger leadership engagement. These needs echo recommendations by Crawford et al. (2023) on the importance of organizational readiness. Leadership support was viewed as central to enabling resource allocation and fostering a culture that embraces innovation, as suggested in E. M. Rogers et al. (2014) diffusion of innovation theory.

Figure 1 presents the key findings identified from participant insights to illustrate these interrelated themes. The diagram captures five main categories: Perception and Adoption, Institutional Support, Limited and Uneven Usage, Challenges and Concerns, and Productivity.

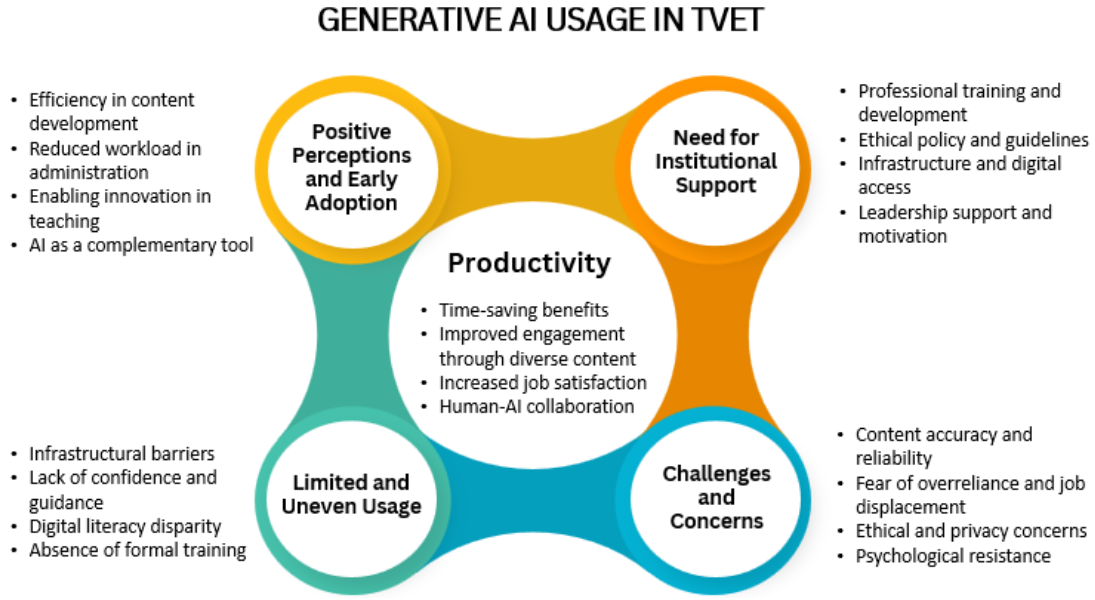

Figure 1. Generative AI Usage in TVET Institutions

This study contributes localized and context-specific insights to the growing research on AI integration in vocational education. It emphasizes that successful GenAI adoption requires more than technological availability. Effective implementation depends on capacity building, ethical governance, and strategic institutional support to convert potential into sustained and inclusive productivity gains.

CONCLUSION

This study investigated the perceptions, experiences, and challenges surrounding using Generative Artificial Intelligence (GenAI) to enhance work productivity in public Technical and Vocational Education and Training (TVET) institutions in Indonesia. The findings reveal a generally positive attitude toward GenAI's potential to improve instructional and administrative functions. Early adopters reported significant efficiency gains and qualitative improvements in educational content, affirming GenAI as a valuable tool for enhancing vocational education.

However, the study also identified substantial barriers impeding widespread and equitable GenAI adoption. These challenges include infrastructural limitations, disparities in digital literacy, concerns over the

accuracy and reliability of AI-generated content, ethical considerations, and a lack of formal training and institutional guidelines. Such obstacles illustrate the complex socio-technical ecosystem within which GenAI integration must be carefully managed.

Institutional support emerged as a pivotal factor for successful adoption. Comprehensive training programs, clear policies addressing ethical AI use and data privacy, robust technological infrastructure, and committed leadership are prerequisites to fostering an enabling environment. Addressing these dimensions can empower TVET institutions to leverage the benefits of GenAI effectively while mitigating associated risks.

This study contributes to existing literature by providing empirical insights into the early adoption dynamics of GenAI in a public TVET context in a developing country, an area still underexplored in current AI and vocational education research. It highlights the interplay between technological innovation and organizational readiness, advancing our understanding of digital transformation in vocational training.

Nevertheless, the research has some limitations. While suitable for exploratory insights, the qualitative design and purposive sampling limit the generalizability of findings across all Indonesian public TVET institutions or other contexts. Additionally, the study captures a snapshot in time; ongoing technological developments and institutional changes may influence future perceptions and adoption patterns.

Based on the findings, the study offers the following recommendations:

1. Develop and implement targeted training programs to improve digital literacy and build competencies necessary for effective GenAI utilization among instructors and administrative staff.
2. Establish clear institutional policies and guidelines that govern ethical AI use, data privacy protection, and quality assurance to ensure responsible and trustworthy adoption.
3. Invest in reliable and equitable digital infrastructure, ensuring stable internet connectivity and access to modern devices across all TVET institutions, including remote and under-resourced areas.
4. Encourage leadership engagement and advocacy to prioritize AI integration initiatives, allocate adequate resources, and foster an organizational culture supportive of technological innovation.

Future research could complement this study by employing quantitative methodologies to measure productivity changes resulting from GenAI implementation objectively. Additionally, exploring learner perspectives on AI-enhanced educational environments would provide a more holistic understanding of GenAI's impact. Longitudinal studies tracking the evolution of AI adoption and its long-term effects within the TVET sector are also warranted. In conclusion, while Generative AI is promising to advance work productivity in public TVET institutions, its successful integration depends on a holistic approach that addresses technological, human, and organizational factors.

ACKNOWLEDGMENT

We sincerely thank all Global TVET Management Program professors at Korea University of Technology and Education (KOREATECH) for their invaluable guidance, support, and mentorship throughout this paper.

REFERENCES

Akanzire, B. N., Nyaaba, M., & Nabang, M. (2025). Generative AI in teacher education: Teacher educators' perception and preparedness. *Journal of Digital Educational Technology, 5*(1), ep2508. https://doi.org/10.30935/jdet/15887

Alier, M., Peñalvo, F. J. G., & Camba, J. D. (2024). Generative artificial intelligence in education: From deceptive to disruptive. *International Journal of Interactive Multimedia and Artificial Intelligence, 8*(5), 5–14. https://doi.org/10.9781/ijimai.2024.02.011

Baidoo-Anu, D., & Ansah, L. O. (2023). Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning. *Journal of AI, 7*(1), 52–62. https://doi.org/10.61969/jai.1337500

Baharin, A. T., Sahadun, N. A., Ramli, S., & Redzuan, N. A. I. (2024). Exploring the adoption of generative artificial intelligence by TVET students: A UTAUT analysis of perceptions, benefits, and implementation challenges. https://www.researchgate.net/publication/389879224

Blessing, E., & Hubert, K. (2024). Technological infrastructure and challenges: Integration challenges in implementing AI solutions in legacy systems. https://doi.org/10.5281/zenodo.14926031

Crawford, J., Cowling, M., & Allen, K.-A. (2023). Leadership is needed for ethical ChatGPT: Character, assessment, and learning using artificial intelligence (AI). *Journal of University Teaching and Learning Practice, 20*(3), 1–19. https://doi.org/10.3316/informit.T2024112000002891427961342

Deckker, D., & Sumanasekara, S. (2025). AI in vocational and technical education: Revolutionizing skill-based learning. *EPRA International Journal of Multidisciplinary Research, 11*(3), 9–23. https://www.academia.edu/download/121672520/

Dhamani, N. (2024). *Introduction to generative AI*. Simon & Schuster.

Falaq, F. I., Nafi'a, M. Z. I., & Damayanti, N. D. (2023). Strategy for implementing artificial intelligence in revitalizing vocational education in Indonesia: Analysis of challenges and opportunities. *Innovative: Journal of Social Science Research, 3*(4), 10497–10505. https://doi.org/10.31004/innovative.v3i4.16362

Galindo-Domínguez, H., Delgado, N., Campo, L., & Losada, D. (2024). Relationship between teachers' digital competence and attitudes towards artificial intelligence in education. *International Journal of Educational Research, 126*, 102381. https://doi.org/10.1016/j.ijer.2024.102381

George, A. S. (2023). The potential of generative AI to reform graduate education. *Partners Universal International Research Journal, 2*(4), 36–50. https://doi.org/10.5281/zenodo.10421475

Ishrat, M., Khan, W., Faisal, S. M., Ansari, M. S. H., & Ahmad, F. (2025). Future trends and challenges for AI and sustainability in TVET. In *Integrating AI and sustainability in technical and vocational education and training (TVET)* (pp. 1–32). IGI Global. https://doi.org/10.4018/979-8-3373-1142-5.ch001

Kadaruddin, K. (2023). Empowering education through generative AI: Innovative instructional strategies for tomorrow's learners. *International Journal of Business, Law, and Education, 4*(2), 618–625. https://doi.org/10.56442/ijble.v4i2.215

Kimutai, S. K., Kitonyi, T., & Kimitei, E. K. (2025). An evaluation of Kenya TVET trainers on use of AI in instruction design and delivery. *Africa Journal of Technical and Vocational Education and Training, 10*(1), 13–27. https://doi.org/10.69641/afritvet.2025.101193

Künnap, V. (2025). *Generative artificial intelligence applications in different industries*. [Publisher not stated].

Lim, W. M. (2025). What is qualitative research? An overview and guidelines. *Australasian Marketing Journal, 33*(2), 199–229. https://doi.org/10.1177/14413582241264619

Mao, J., Chen, B., & Liu, J. C. (2024). Generative artificial intelligence in education and its implications for assessment. *TechTrends, 68*(1), 58–66. https://doi.org/10.1007/s11528-023-00911-4

Niwamanya, G., Zhong, Z., Matola, C. A., Eliachu, D., Ravindra, S., & Fahn, J. B. (2025). Bridging the digital divide through enterprise-TVET provider partnerships: Strategic insights on digital transformation in TVET in developing nations. *Vocation, Technology & Education, 2*(2). https://doi.org/10.54844/vte.2025.0977

Okumu, G. J., & Kenei, J. K. (2024). Adoption of artificial intelligence in technical and vocational education and training institutions in Kenya. *The Kenya Journal of Technical and Vocational Education and Training, 7*(2). https://www.tveta.go.ke/wp-content/uploads/2024/07/KJ-TVET_Vol._71.pdf#page=11

Omeh, C. B., Olelewe, C. J., & Hu, X. (2025). Application of artificial intelligence (AI) technology in TVET education: Ethical issues and policy implementation. *Education and Information Technologies, 30*(5), 5989–6018. https://doi.org/10.1007/s10639-024-13018-x

Pan, L., & Filippova, A. (2024). A critical examination on EdTech integration in TVET curriculum: Insights from a Chinese TVET institution. *Vocation, Technology & Education, 1*(2). https://doi.org/10.54844/vte.2024.0593

Peng, D., & Yu, Z. (2022). A literature review of digital literacy over two decades. *Education Research International, 2022*(1), 2533413. https://doi.org/10.1155/2022/2533413

Petridou, E., & Lao, L. (2024). Identifying challenges and best practices for implementing AI additional qualifications in vocational and continuing education: A mixed methods analysis. *International Journal of Lifelong Education, 43*(4), 385–400. https://doi.org/10.1080/02601370.2024.2351076

Rogers, E. M., Singhal, A., & Quinlan, M. M. (2014). Diffusion of innovations. In D. K. Berger & M. E. Roloff (Eds.), *An integrated approach to communication theory and research* (pp. 432–448). Routledge.

Rogers, M., & Rogers, M. (1998). *The definition and measurement of productivity*. Melbourne Institute of Applied Economic and Social Research.

Rongchang, J., Yonghong, C., Yi, P., Shijie, X., & Dandan, Q. (2024). Opportunities and challenges of AI in vocational education. *International Journal of Learning and Teaching, 10*(5), 590–596. https://doi.org/10.18178/ijlt.10.5.590-596

Russell, S. J., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.

Sahu, M. N. (2024). The GenAI revolution: Unleashing the role of information technology in education. *Sudarshan Research Journal, 2*(5), 55–75. https://sudarshanresearchjournal.com/wp-content/uploads/2024/06/THE-GENAI-REVOLUTION-UNLEASHING-THE-ROLE-OF-INFORMATION-TECHNOLOGY-IN-EDUCATION.pdf

Tawfik, A. A., Reeves, T. D., & Stich, A. (2016). Intended and unintended consequences of educational technology on social inequality. *TechTrends, 60*(6), 598–605. https://doi.org/10.1007/s11528-016-0109-5

Thakur, G. S. M., Banerjee, A., & Sarkar, P. (2025). AI in vocational education and training: Technologies and applications. In *Transforming vocational education and training using AI* (pp. 49–72). IGI Global. https://doi.org/10.4018/979-8-3693-8252-3.ch003

Tracy, S. J. (2024). *Qualitative research methods: Collecting evidence, crafting analysis, communicating impact*. John Wiley & Sons.

UNESCO. (2016). *Recommendation concerning technical and vocational education and training (TVET)*. UNESCO.

UNESCO. (2021). *UNESCO strategy for TVET (2022–2029): Transforming TVET for successful and just transitions*. http://www.unesco.org/open-access/terms-use-ccbysa-en

Williamson, B., Macgilchrist, F., & Potter, J. (2023). Re-examining AI, automation and datafication in education. *Learning, Media and Technology, 48*(1), 1–5. https://doi.org/10.1080/17439884.2023.2167830

Zahri, Z. S. A., Chanthiran, P. V., Yunus, M. M., & Rafiq, K. R. M. (2023). ChatGPT: Investigating academic staff's awareness and utilization in teaching and learning strategies. *International Journal of Academic Research in Business and Social Sciences, 13*(12), 3630–3643. https://doi.org/10.6007/IJARBSS/v13-i12/20249

Zary, A., & Zary, N. (2025). Artificial intelligence in technical and vocational education and training: Empirical evidence, implementation challenges, and future directions. https://www.preprints.org/frontend/manuscript/cadce590828df3f67d77ba9bab8fe737/download_pub

Zlotnikova, I., Hlomani, H., Mokgetse, T., & Bagai, K. (2025). Establishing ethical standards for GenAI in university education: A roadmap for academic integrity and fairness. *Journal of Information, Communication and Ethics in Society, 23*(2), 188–216. https://doi.org/10.1108/JICES-07-2024-0104