ICEET 2026
The International Conference on English Education and Technology

Vol.01 No.01, February 2026

PRE-SERVICE TEACHERS' READINESS FOR USING ARTIFICIAL INTELLIGENCE TECHNOLOGY IN INTEGRATING 21ST-CENTURY EFL LEARNING

[1]Sumarsih, [2]Gisna Auliya, Dedi Sulaeman
[12]Universitas Islam Negeri Sunan Gunung Djati Bandung
[1]sumarsih030420@gmail.com, [2]gisnaauliya30@gmail.com, dedi4548@uinsgd.ac.id

First Received: 2026-01-12 Final Proof Received: 2026-02-17

Abstract

The rapid development of artificial intelligence (AI) has brought significant changes to educational practices, particularly in the teaching of English as a Foreign Language (EFL), by supporting the development of 21st-century skills. Although various studies have discussed the potential of AI in education, there remains a gap between theoretical studies and classroom teaching practices, especially concerning the readiness of pre-service teachers to integrate AI into 21st-century EFL learning. Therefore, this study aims to explore pre-service teachers' readiness for using AI technology in integrating 21st-century EFL learning. This study uses a qualitative method with a case study approach involving five sixth-semester students of the English Education Study Program at a state Islamic university. Data were collected through structured face-to-face interviews and analyzed using thematic analysis based on the 21st-century learning framework. The results indicate that pre-service teachers have fairly good readiness in integrating AI into various aspects, including reinforcing global themes, developing 4Cs skills (Critical Thinking, Communication, Collaboration, Creativity), improving information, media, and technology skills, strengthening life and career skills, as well as utilizing technology-based support systems for feedback and more adaptive learning. This study contributes by providing an empirical overview of the readiness of pre-service EFL teachers in integrating AI based on 21st-century skills, as well as serving as a reference for educational institutions and curriculum developers in designing relevant and sustainable teacher training programs.

Keywords: Artificial intelligence, EFL learning, pre-service teachers' readiness, 21st-century skills

INTRODUCTION

Technological developments in the 21st-century have significantly shifted teaching and learning practices in educational contexts. Digital technology facilitates access to information and also fosters student motivation to be more interested in learning. Certainly, integrating technology in learning will greatly help the language learning process, especially in the 21st-century (Hadiyastama et al., 2022). By integrating technology in language learning, students can develop digital literacy and communication skills needed to interact effectively in the digital era. In addition, the use of technology also helps to improve 21st-century skills that are equally important in language learning.

The transformation of language learning driven by the advancements in Information Communication and Technology (ICT) from traditional tools to intelligent digital innovations. The paradigm shift has led by the integrations of artificial intelligence (AI) in language learning, termed Intelligent Technology-Enhanced language learning (ITELL) (Novawan, Walker, & Ikeda, 2024; Koraishi, 2023). Artificial intelligence plays an important role in teaching practices and teacher professional development (Tan, Cheng, & Ling, 2025). The integration of AI facilitates teachers in the design process and provides ready-made

components. (Krushinskaia, Elen, & Raes, 2026). However, the successful integration of AI in language teaching and learning depends on the teacher's readiness. Understanding the readiness of pre-service teachers to integrate AI into their teaching is crucial as AI continues to transform education (Sadaf, Maxwell, Küplüce, & Holz, 2025) Therefore, teachers must have adequate technology skills, as well as a deep understanding of how to effectively utilize AI in the learning process, especially in the 21st-century learning.

The 21st-Century Framework developed by The Partnership for 21st-Century Learning (P21) provides guidance for the development of essential skills and knowledge for the 21st-Century. The aspects of skills that must be mastered such as 4C skills (Critical Thinking, Communication, Collaboration, Creativity), Life and Career skills, and Information, Media, Technology skills. By mastering these aspects, students are expected to be able to successfully face today's global challenges. This framework is the goal of learning, while AI is a tool to achieve that goal. Artificial Intelligence has enabled teachers to create adaptive and dynamic learning that matches students' abilities (Bean & Melzer, 2021 as cited in Jaramillo & Chiappe, 2024). Personalized learning paths through problem-solving simulation exercises using AI can develop essential 21st-century skills, including critical thinking and problem-solving skills (Jaramillo & Chiappe, 2024 as cited in Chasokela, 2025). The use of AI in language learning matches the needs of 21st-century skills by enhancing critical thinking, creativity, collaborative, communicative and digital literacy (Aryusmar, 2025).

There have been several previous studies related to the application of AI in language learning. Systematic reviews of Artificial Intelligence in Education (AIed) have revealed a significant gap between theoretical models and practical implementation in higher education (Chen et al., 2020 ; Zawacki-Richter et al., 2019). This is in line with the findings of Omidvar and Meihami (2025), who identified ways in which AI can be integrated into the context of teaching English as a Foreign Language (EFL). AI can help teachers design personalized learning and optimize time management in providing feedback, evaluation, and assessment to students. Rahm and Rahm-Skågeby (2023) through an analysis of imaginaries and problematizations describe how artificial intelligence in education is not just technology but a tool that helps determine how teachers' learn, teach and assess students. Despite its benefits, AI also has limitations, including the potential to inhibit teacher creativity and reduce human interaction, so pedagogical and digital literacy are needed to minimize dependence on AI (Omidvar & Meihami, 2025).

In the context of teaching English as a Foreign Language (EFL), Alhalangy and AbdAlgane (2023) conducted an analysis and review of previous research on artificial intelligence (AI) in EFL/ESL teaching. Where ethics and responsibility in the effective use of AI must be carried out by educators and students themselves. A systematic review by Tan, Cheng, and Ling (2025) explored how teachers apply AI in their teaching practices and professional development. Tan et al. (2025) also examined the interaction between teachers' AI competencies and their pedagogical content technology knowledge (TPACK). Teachers' AI competencies positively predicted their TPACK levels and teaching performance. TPACK was found to act as a tool in the relationship between teachers' AI competencies and teaching performance.

Research conducted by Aryusmar (2025) on the integration of Artificial Intelligence (AI) with 21st-century skills in language education, utilizing academic review papers, scholarly works, and reports. Using Artificial Intelligence (AI) in language education is a big

change that fits with the skills needed in the 21st-century, like critical thinking, creativity, working together, communicating, and digital literacy. AI in education can help students learn skills they will need in the 21st-century. (Chasokela, 2025)

Furthermore, recent studies on how pre-service teachers and EFL teachers view the integration of AI in the learning process were conducted by Özkan et al. (2024) through systematic reviews. AI is considered to help ease teachers' work by contributing to lesson plans, materials development, and providing feedback to students. EFL teachers generally see AI as a tool for aiding language teaching, increasing student engagement, promoting personalized learning, and improving overall teaching efficiency. Teachers had positive perceptions towards the use of AI and agreed that AI could help teachers teach and students learn. Pre-service teachers' perceptions for effective AI integration based on social cognitive theory, focusing on their attitudes, intentions, self-efficacy, and AI literacy requires more awareness of the possible changes in teachers' functions and roles in collaborative AI-integrated education, leading to specific teacher-training demands that aid them in success in AI-integrated education (Guan et al., 2025). Pre-service teachers' on how to effectively integrate AI tools into teaching practice were significantly influenced by their prior knowledge, technological abilities, TPACK, and anxiety towards generative AI (Wang et al., 2024).

Research conducted by Lucas et al. (2025) investigated the readiness of pre-service teachers in Portugal and Spain to integrate AI into future teaching practices and found that pre-service teachers' readiness for AI integration differs across contexts. Sadaf et al. (2025) examined the ethical interconnected roles of competency, affect, and in shaping pre-service teachers' readiness for AI integration in teaching shows that there is a strong relationship between competencies and positive affective dispositions, particularly self-efficacy and interest in using AI. Granström and Oppi (2025) examined Estonian teachers' AI readiness and perceptions. Teachers' willingness to use AI technology depends on their self-confidence and perceived importance to teaching. Professional development and policy support for teachers' preparation are urgently needed to responsibly integrate AI into educational practices due to limited training possibilities. Dung (2025) explored the readiness of English language teachers from public and private institutions in Vietnam to integrate artificial intelligence into teaching. Limited institutional support influenced their competence and attitudes toward AI. Consistent with Purnama et al. (2025), teachers' readiness to integrate artificial intelligence into education for the digital revolution is affected by technical skills, institutional support, and school infrastructure. This finding was based on differences between urban and rural teachers, who have different environments. Urban teachers have easier access to training than rural teachers.

Although previous studies have examined the integration of artificial intelligence (AI) in education and its potential to support the development of 21st-century skills, research specifically focusing on prospective teachers' readiness to integrate AI in the context of 21st-century English as a foreign language (EFL) learning has been under-explored. Therefore, this study aims to explore pre-service teachers' readiness for using artificial intelligence technology in integrating 21st-century EFL learning.

METHOD

Research Design

In this study, the researcher used a qualitative method to obtain information related to Pre Service Teachers' Readiness for Using AI Technology in 21st-Century EFL Learning. Since the researcher wants to know the experiences and opinions of the research subjects related to the topic, it is in accordance with the qualitative method which is able to obtain further and in-depth information about the experiences and opinions of the interviewees. This research uses a case study approach with the aim of understanding how a phenomenon occurs and how it affects the individuals or groups involved. In this research, this approach is used to collect data through interviews to understand the topic under study.

Participants

The research subjects chosen for this study were 5 students of 6th semester at the English Education Department in a public Islamic university. Researchers chose participants based on considerations of correlation with the themes raised in the study. In this study, participants' names were replaced with initial names.

Data Collection Procedure

In this study, researchers used a structured interview with a one-on-one interview. The research was conducted in a face to face interview. The first step taken by the researcher is to make a list of questions that will be used to explore data through interviews. In this case, the researcher made 15 questions related to the topic under study using theories related to the framework used, namely the 21st-Century Framework.

Furthermore, the researcher compiled an interview guideline to help the interview process to be systematic. After the researcher determined the participants, the researcher collected data by conducting interviews one by one with the participants. The interview was conducted by asking all questions, recording the audio of the interview, and conducting documentation in the form of taking pictures. After that, the data taken was transcribed verbatim for analysis.

Data Analysis Technique

Researchers analyzed the data using thematic analysis. There are 2 steps used to analyze the data. First, the researcher reads the entire content or interview transcripts that have been obtained and tries to find the meaning of the data. In this case, the researcher noticed patterns that were repeatedly conveyed by the interviewees. Researchers pay attention to the relationship between one topic and another.

The next step is for researchers to create theoretical concepts related to the themes that have been classified previously. The researcher then connects the concepts that have been made with existing theories or literature. The results of data analysis will be interpreted in the discussion section to find research results.

FINDINGS AND DISCUSSION

Key Subjects – 3Rs & 21st-Century Themes

In this topic, researchers discussed topics related to key subjects and 21st-century themes. In this case, the questions provided focused on the topics of addressing global issues, knowledge of governmental processes and civic life, and investigating environmental issues. The following table presents teachers' responses to these topics.

Table 1. Teachers' Response for Key Subjects – 3Rs & 21st-Century Themes

Key Subjects – 3Rs & 21st-Century Themes	Teachers' Response
Addressing Global Issues	Using AI technology that matches the learning system to provide

	material that is updated to the current condition. Relating to digital learning in the current era. Integrate the AI technology with the use of smartphones in classroom learning. Implementing group work that is collaborative to discuss issues that have recently occurred to be creative.
Knowledge of Governmental Processes and Civic Life	Do a data analysis first to find which material is suitable for the students at their level. The material used is based on the coursebook. Searching the material on google and making teaching modules.
Investigating Environmental Issues	Always be updated with the latest situation by conveying the news that is happening. Provides in-depth research about the case using AI technology to explain it in the class.

In table 1, the findings indicate that teachers tend to integrate AI technology to support the provision of learning materials that is relevant to current conditions. Teachers also link learning activities to the digital learning context and encourage the use of smartphones as learning tools. Furthermore, collaborative group work activities are implemented to discuss current issues with the aim of enhancing student creativity and active participation.

It shows that teachers are beginning to adopt technology-based learning practices that align with 21st-century skills, particularly digital literacy, collaboration, and critical thinking. The integration of AI and digital learning resources reflects teachers' awareness of the importance of contextualized learning materials. This is in line with study from Aghayeva (2025) that shows the integration of AI in language teaching reflects an awareness of the importance of contextualized learning materials by offering solutions to traditional teaching challenges and enhancing students' understanding of context. Furthermore, the implementation of collaborative discussions indicates a shift toward student-centered learning, which allows students to actively engage with real-world problems and develop problem-solving skills that are relevant to today's educational demands. Collaborative learning enhances student outcomes by developing cognitive, social, and emotional skills , fostering critical thinking, creativity, and communication, which are essential for addressing 21st-century challenges (Fauza Okta Ramadan et al., 2024).

Learning & Innovation Skills – 4Cs

In the second topic, researchers discussed topics related to learning and innovations skills. The questions in this topic are focused on how to train students' creativity and innovation, examples of problems that can implement 4Cs skills, and how to organise the use of media without reducing the effectiveness of the media used. Teachers' responses are presented in the following table.

Table 2. Teachers' Response for Learning and Innovations Skills

Learning and Innovations Skills	Teachers' Response
Train Creativity and Innovations	Provide or facilitate the learning process with supporting technology. Using apps that they have not used or do not know yet. Integrating AI technology to do assignments.
Present Problems in 4Cs skills	Delivering a news story that is practically viral. Learn a lot of various texts that relate to current issues
Organize the Use of Media	Use the media or technology that teachers are good at and the students must be able to use it.

Analyze which AI Technology is more effective and useful.

This table shows that teachers strive to foster student creativity and innovation by facilitating the learning process through the use of supporting technology. They also encourage the use of applications that are unfamiliar to students and integrate AI technology into assignments. Furthermore, contextual problem-solving, such as viral news stories and texts related to current issues, is used to foster critical thinking and problem-solving skills. In organizing media use, teachers consider the appropriateness of their abilities and student readiness and analyze the effectiveness of the AI technology used.

These findings indicate that teachers are aware of the importance of developing 21st-century skills through innovative and technology-based learning. The use of technology, including AI, functions not only as a learning aid, but also as a means to foster students' creativity, exploration, and critical thinking. The application of contextual problems and media relevant to real-life situations reflects teachers' efforts to create authentic learning experiences. It is important because authentic learning environments, enhanced by technology, can make learning more meaningful and interactive (Bhagat & Huang, 2018). Furthermore, the implementation of the 4Cs in learning contributes to the development of student competencies needed to face educational and work challenges in the digital era.

Information, Media, & Technology Skill

In the third topic, researchers discussed topics related to Information, Media & Technology Skill. The questions asked related to this topic were related to learning information that is accurate and easily accessible to students, the technology used by teachers to find material information, and the use of ethical media. The following table presents the results for these topics.

Table 3. Teachers' Response for Information, Media, & Technology Skill

Information, Media, & Technology Skill	Teachers' Response
Accurate and Accessible Learning Information	Access from a trusted source. It must be factual information that can be accessed using cellphones.
Material Searching Tools	Google Scholar, Google Classroom, LibGenesis, YouTube, Quizziz, Learning Websites.
Ethical Media	Know the rules or ethical guidelines first. Not contain racial elements

In table 3, the results show that teachers emphasize the importance of providing accurate information that is easily accessible to students through trusted sources, including factual information that can be accessed using mobile devices. In searching for learning materials, teachers utilize various digital platforms such as Google Scholar, Google Classroom, LibGen, YouTube, Quizizz, and other learning websites. Additionally, teachers also emphasize the importance of using media ethically by understanding ethical guidelines and avoiding content that contains discriminatory elements.

These findings indicate that teachers have a high awareness of information and media literacy in the digital era. The emphasis on reliable sources and factual information reflects teachers' efforts to equip students with the ability to critically sort and evaluate information. Teachers can give exercises to teach students how to identify reliable online sources and fact-

check information, enhancing their ability to critically evaluate information (Topal & Shargh, 2023). Teachers also use various digital platforms that demonstrate teachers' flexibility in integrating technology to support the learning process. Furthermore, attention to media ethics underscores the role of teachers in instilling values of responsibility and moral awareness in the use of technology and digital media. Technology ethics enhances digital teaching competence and amplifies trans-media literacy's impact, highlighting its role in instilling responsibility and moral awareness in technology use (Li, 2024).

Life & Career Skills

In the fourth topic, researchers discussed topics related to Life & Career Skills. The questions asked related to this topic were how to introduce life & job skills to students, the cultural context that teachers teach, and how teachers manage work to achieve the desired results. Teachers' responses are presented in the following table.

Table 4. Teachers' Response for Life & Career Skills

Life & Career Skills	Teachers' Response
Introduce Life and Job Skills	Research experiences from people and then make references to be explained to students. Direct students to where they want to go forward. Teach students how to make a CV.
Cultural Context	Must refer to the culture of students surrounding environment. Growing a sense of affection to the country's culture. Understanding tolerance.
Manage Working	Honing soft skills. Pay attention to the curriculum, pedagogy, and assessment. Exploring the characteristics, interests and skills of students. Receive feedback from students.

This table reveals the results of the study that teachers introduce life skills and the working world through activities that explore real-life experiences from various sources, which are then used as learning references for students. Teachers also guide students in planning their future direction and train practical skills, such as preparing a curriculum vitae (CV). In the cultural context, teachers emphasize the importance of learning that refers to the students' environment and culture, fostering a love for the nation's culture, and developing attitudes of tolerance to diversity. In addition, teachers manage the learning process by paying attention to soft skills, alignment with the curriculum, pedagogy, and assessment, as well as understanding students' characteristics, interests, and needs.

The findings show that teachers play a crucial role in preparing students for life and the workforce through holistic and contextual learning. This supports the view that teachers are crucial in preparing students for the workforce by being proactive and responsive, supervising practical learning to develop necessary skills (Mariah & Sari, 2019). The integration of life skills, cultural understanding, and soft skills reflects teachers' efforts to develop students' competencies comprehensively. This approach not only helps students understand academic demands but also equips them with adaptive, social, and professional skills needed to face challenges in a dynamic and global era.

Support System

In the last topic, researchers discussed topics related to the Support System in 21st-century Learning. The questions asked related to this topic were integrating feedback to improve students' abilities, integrating supporting technology into learning methods, and developing

skills to find out learning styles and students' weaknesses and strengths. The following table presents teachers' responses to these topics.

Table 5. Teachers' Response Support System

Support System	Teachers' Response
Integrating Feedback	Using grades that can be supported by AI technology. Appreciating students.
Supporting Technology	Google Forms, Quizzes, Quizzalize, Zoom, Google Docs.
Navigating Learning Styles and Students' Weaknesses and Strengths	Not only focus on one learning style. Conducting a pretest. Understand what kind of media or technology that is suitable for students. Read many journal articles using AI technology as a source of reference.

The results show that teachers integrate feedback by utilizing assessments supported by AI technology and providing appreciation to students. In supporting the use of technology, teachers make use of various digital platforms such as Google Forms, Quizizz, Quizzizle, Zoom, and Google Docs. Furthermore, teachers also consider the diversity of students' learning styles as well as the strengths and weaknesses of each student through the implementation of pre-test, the selection of appropriate media or technology, and the use of AI to search journal articles as reference sources.

These findings indicate that the learning support system implemented by teachers plays an important role in creating a learning process that is adaptive and responsive to students' needs. The integration of technology for feedback allows teachers to monitor students' learning progress more effectively and continuously. This finding confirms previous studies which argue that technology-enhanced feedback systems enable real-time, multi-type feedback and facilitate self-assessment, allowing teachers to monitor students' learning progress more effectively (Huang et al., 2025). Furthermore, paying attention to variations of learning styles and mapping students' strengths and weaknesses reflects an inclusive and student-centered learning. With the proper technological support, the learning process can be more personalized, meaningful, and effective in facing the challenges of 21st-century education.

CONCLUSION AND SUGGESTION

The use of digital technologies in the classroom has created a dynamic learning environment that could enhance learning and teaching especially in 21st-century learning. This study explored a group of pre-service EFL teachers' readiness on the use of technology in language and learning. The results show that in the aspect of key subjects and 21st-century themes, the teacher already knows how to address global issues, prepare learning materials well, and analyse the learning environment. Then in the aspect of learning and innovation, the teacher is able to train students' creativity and innovation, provide examples of problems that can implement 4Cs skills, and organise the use of media without reducing the effectiveness of the media used. In the aspect of information, media and technology, teachers are able to determine learning information that is accurate and easily accessible to students, use technology to find material information, and use ethical media. Then in the aspect of life & career skills, teachers know how to introduce life & job skills to students, teach cultural context, and are able to manage work to achieve the desired results. In the last aspect, the support system, teachers integrate feedback to improve students' abilities, integrate

supporting technology into learning methods, and know how to find out learning styles and students' weaknesses and strengths. Based on the research results, it can be concluded that teachers have shown good readiness in integrating 21st-century skills through the use of AI technology and innovative learning approaches.

REFERENCES

Aghayeva, J. G. (2025). THE CHALLENGES OF TEACHING CULTURAL CONTEXT IN LANGUAGE WITH HELP OF AI. *The Actual Problems of Study of Humanities*, *1*(2025), 326–330. https://doi.org/10.62021/0026-0028.2025.1.326

Alhalangy, A. G. I., & AbdAlgane, M. (2023). *Exploring the impact of AI on the EFL context: A case study of Saudi universities*. Journal of Intercultural Communication, 23(2), 41–49. https://doi.org/10.36923/jicc.v23i2.125

Aryusmar, A. (2025). *Exploring AI integration with 21st-century skills in language education*. In *Proceedings of the 7th International Conference on Community Development (ICCD)* (Vol. 7, No. 1, pp. 127–132). https://doi.org/10.33068/iccd.v7i1.850

Bhagat, K. K., & Huang, R. (2018). Improving Learners' Experiences Through Authentic Learning in a Technology-Rich Classroom. In T.-W. Chang, R. Huang, & Kinshuk (Eds.), *Authentic Learning Through Advances in Technologies* (pp. 3–15). Springer Singapore. https://doi.org/10.1007/978-981-10-5930-8_1

Chasokela, D. (2025). Integrating Artificial Intelligence in STEM Education: Enhancing 21st Century Skills in Zimbabwean Universities. *Journal of Research in Environmental and Science Education*, *2*(2), 68–80. https://doi.org/10.70232/jrese.v2i2.16

Chen, X., Xie, H., Zou, D., & Hwang, G.-J. (2020). *Application and theory gaps during the rise of Artificial Intelligence in Education*. Computers and Education: Artificial Intelligence, 1, 100002. https://doi.org/10.1016/j.caeai.2020.100002

Dung, L. Q. (2025). A structural model of Vietnamese EFL teachers' readiness to integrate AI in English language teaching. *World Journal on Educational Technology: Current Issues*, *17*(2), 89–99. https://doi.org/10.18844/wjet.v17i2.9665

Fauza Okta Ramadan, Syarif Rusdan, & Gusmaneli Gusmaneli. (2024). Transformasi Desain Pembelajaran Kolaboratif dalam Mendukung Pembelajaran Aktif. *Bhinneka: Jurnal Bintang Pendidikan Dan Bahasa*, *3*(1), 147–164. https://doi.org/10.59024/bhinneka.v3i1.1140

Granström, M., & Oppi, P. (2025). Assessing teachers' readiness and perceived usefulness of AI in education: An Estonian perspective. *Frontiers in Education*, *10*, 1622240. https://doi.org/10.3389/feduc.2025.1622240

Guan, L., Zhang, Y., & Gu, M. M. (2025). *Pre-service teachers preparedness for AI-integrated education: An investigation from perceptions, capabilities, and teachers' identity changes*. Computers and Education: Artificial Intelligence, 8, 100341. https://doi.org/10.1016/j.caeai.2024.100341

Hadiyastama, M. F. A., Nurwahidin, M., & Yulianti, D. (2022). *The role of educational technology in 21st-century learning*. Jurnal Pengembangan Profesi Pendidik Indonesia, *1*(1), 11–18.

Huang, W., Stephens, J. M., & Brown, G. T. L. (2025). Feedback Assisted by Technology: A Systematic Review of Empirical Research. *International Journal of Technology in Education*, *8*(2), 421–444. https://doi.org/10.46328/ijte.1061

Jaramillo, J.J., Chiappe, A. The AI-driven classroom: A review of 21st century

curriculum trends. *Prospects* 54, 645–660 (2024). https://doi.org/10.1007/s11125-024-09704-w

Koraishi, O.(2023). Teaching English in the Age of AI: Embracing ChatGPT to Optimize EFL Materials and Assessment. Language Education & Technology(LET Journal), 3(1), 55-72

Krushinskaia, K., Elen, J., & Raes, A. (2026). *Pre-service teachers' agency during their interactions with generative AI while designing for learning: A process view on Intelligent-TPACK*. Computers and Education Open, 10, 100325. https://doi.org/10.1016/j.caeo.2025.100325

Li, X. (2024). The Role of Technology Ethics in the Relationship between Trans-Media Literacy and Digital Teaching Competence among Pre-Service Teachers: A Study Based on Partial Least Squares Structural Equation Modeling (PLS-SEM). *Proceedings of the 2024 International Symposium on Artificial Intelligence for Education*, 559–563. https://doi.org/10.1145/3700297.3700393

Lucas, M., Bem-Haja, P., Zhang, Y., Llorente-Cejudo, C., & Palacios-Rodríguez, A. (2025). A comparative analysis of pre-service teachers' readiness for AI integration. *Computers and Education: Artificial Intelligence*, *8*, 100396. https://doi.org/10.1016/j.caeai.2025.100396

Mariah, S., & Sari, A. (2019). Revitalizing the role of teachers in practice learning to increase vocational students readiness. *Journal of Physics: Conference Series*, *1273*(1), 012039. https://doi.org/10.1088/1742-6596/1273/1/012039

Novawan, A., Walker, S. A., & Ikeda, O. (2024). The New Face of Technology-Enhanced Language Learning (TELL) with Artificial Intelligence (AI): Teacher perspectives, practices, and challenges . *Journal of English in Academic and Professional Communication*, *10*(1), 1–18. https://doi.org/10.25047/jeapco.v10i1.4565

Omidvar, S., & Meihami, H. (2025). Exploring the "what" and "how" of opportunities and challenges of AI in EFL teacher education. *Computers and Education: Artificial Intelligence*, *9*, 100443. https://doi.org/10.1016/j.caeai.2025.100443

Özkan, E. K., Erdemir, N., & Coşkun, D. (2024). *A systematic review of EFL teachers' perspectives on artificial intelligence technologies*. Ihlara Journal of Educational Research, 9(2), 150–168. https://doi.org/10.47479/ihead.1535035

Purnama, M. R., Adnyana, I. P. I. K., Sogen, A. T. L., Indrawan, G., & Santosa, M. H. (2025). *Teacher's readiness toward artificial intelligence in the school of North Bali*. Jurnal Paedagogy, 12(1), 13707. https://doi.org/10.33394/jp.v12i1.13707

Rahm, L., & Rahm-Skågeby, J. (2023). *Imaginaries and problematisations in the age of artificial intelligence in education*. British Journal of Educational Technology, 54(5), 1147–1159. https://doi.org/10.1111/bjet.13319

Sadaf, A., Maxwell, D., Küplüce, C., & Holz, H. (2025). *Relationship between pre-service teachers' perceived competencies, affective dispositions, and readiness to*

use artificial intelligence: A study informed by the intelligent-TPACK. Computers and Education Open, 9, 100305. https://doi.org/10.1016/j.caeo.2025.100305

Sumakul, D. T. Y. G. ., Hamied, F. A. ., & Sukyadi, D. (2022). Artificial Intelligence in EFL Classrooms: Friend or Foe?. *LEARN Journal: Language Education and Acquisition Research Network*, *15*(1), 232–256. retrieved from https://so04.tci-thaijo.org/index.php/LEARN/article/view/256723

Tan, X., Cheng, G., & Ling, M. H. (2024). *Artificial intelligence in teaching and teacher professional development: A systematic review*. Computers and Education: Artificial Intelligence, 8, 100355. https://doi.org/10.1016/j.caeai.2024.100355

Topal, R., & Shargh, F. (2023). Teaching Students How to Find and Identify Reliable Online Sources: A Series of Exercises. *Journal of Political Science Education*, *19*(3), 475–484. https://doi.org/10.1080/15512169.2022.2163899

Wang, K., Ruan, Q., Zhang, X., Fu, C., & Duan, B. (2024). *Pre-service teachers' GenAI anxiety, technology self-efficacy, and TPACK: Their structural relations with behavioral intention to design GenAI-assisted teaching*. Behavioral Sciences, 14(5), 373. https://doi.org/10.3390/bs14050373

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). *Systematic review of research on artificial intelligence applications in higher education: Where are the educators?* International Journal of Educational Technology in Higher Education, 16, Article 39. https://doi.org/10.1186/s41239-019-0171-0