Integrating AI in Subject Teaching for Metacognition Development of Students: Descriptive Essay Writing Chatbot for In-service Chinese Language Teachers

Siu Cheung, Kong [1*], John Chi-Kin, Lee [2], May Hung May, Cheng [2], Boyuan Ren [3], Wenxi Hu [3]

[1] Department of Mathematics and Information Technology, The Education University of Hong Kong, 10 Lo Ping Road, Tai Po, New Territories, Hong Kong

[2] Department of Curriculum and Instruction, The Education University of Hong Kong, 10 Lo Ping Road, Tai Po, New Territories, Hong Kong

[3] Artificial Intelligence and Digital Competency Education Centre, The Education University of Hong Kong, 10 Lo Ping Road, Tai Po, New Territories, Hong Kong

[*] sckong@eduhk.hk

Abstract:

This study designed a subject-specific AI chatbot for teaching descriptive essay writing for in-service primary school Chinese language teachers in Hong Kong. The intervention aimed to enhance teachers' Technological Pedagogical and Content Knowledge (TPACK), metacognition, AI literacy, and self-efficacy in AI-integrated teaching through two two-hour workshops with hands-on activities using a customised AI chatbot. A paired-sample t-test was used to analyse pre- and post-workshop survey data, with 102 valid responses for TPACK and metacognition, and 127 for AI literacy and self-efficacy. Before analysing the results, a reliability analysis was conducted to confirm the validity of the survey instruments used to measure TPACK, metacognition, AI literacy, and self-efficacy. Results showed statistically significant improvements in pedagogical content knowledge (PCK), technological content knowledge (TCK), overall TPACK, metacognition, AI literacy, and self-efficacy ($p < 0.001$), while content knowledge (CK) remained unchanged, likely due to teachers' pre-existing proficiency in subject knowledge. This research advances TPACK-based teacher professional development (TPD) by demonstrating that subject-specific, interactive interventions effectively foster teachers' TPACK competency and underlying skills, highlighting the potential of subject-knowledge-customised TPD for sustainable AI integration in language education. This study contributes to the design of TPD in integrating AI in language education for the development of students' metacognition.

Keywords: *AI Chatbot, AI literacy, Metacognition, Teacher professional development, TPACK*

1. Introduction

The integration of technology into education has highlighted the significance of Technological Pedagogical and Content Knowledge (TPACK) as a foundational framework for effective teaching and learning (Dogan et al., 2025; Ning et al., 2022). It also plays an important role in the metacognition development of students as teachers with strong TPACK can effectively use AI tools to support personalized goal-setting, progress tracking, and collaboration, fostering students' self-regulation, self-awareness, and metacognitive growth (Koh et al., 2017). Despite its importance, existing teacher professional development (TPD) initiatives often emphasize technology acceptance and hands-on capabilities in designing technological resources for instructional practices. However, it is still underexplored how key constructs critical for sustainable TPACK development, such as metacognition, AI literacy, and self-efficacy, can be influenced through TPD (Budianto et al., 2023). To address these limitations, this study designed a customized AI chatbot for teaching descriptive writing and delivered two offline professional development workshops to in-service primary school Chinese language teachers in Hong Kong. The workshops aimed to enhance teachers' TPACK, as well as their metacognitive skills,

AI literacy, and self-efficacy in using AI for teaching. Employing a paired-sample t-test to analyse pre- and post-workshop survey data, the study evaluates the effectiveness of the customized TPD intervention, focusing on identifying differential improvements across TPACK subdomains and their cognitive well-being. This research contributes to advancing TPD by providing empirical evidence of how subject-specific AI tools can foster teachers' professional competencies for technology-enhanced instruction in authentic educational contexts.

2. Literature Review

2.1. TPACK framework

The TPACK framework, initially conceptualized by Mishra and Koehler (2006), has emerged as a widely recognized model for understanding the integration of technology into teaching and learning processes. Building on Shulman's (1986) concept of Pedagogical Content Knowledge (PCK), TPACK adds "technological knowledge" (TK) as a crucial dimension, reflecting the growing significance of technology in education. The framework emphasizes that the effective use of technology in teaching requires a dynamic interplay between three core knowledge domains: content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK). The intersections among these domains create three additional constructs—technological pedagogical knowledge (TPK), technological content knowledge (TCK), and pedagogical content knowledge (PCK)—which culminate in the overarching concept of TPACK. This integrated knowledge is essential for designing and delivering effective technology-enhanced instruction that aligns with both pedagogical strategies and subject-specific learning goals.

2.2. Teacher Professional Development in the Digital Age

Teacher professional development (TPD) refers to a range of educational and training activities designed to enhance teachers' knowledge, skills, and practices, enabling them to meet the evolving demands of education and effectively integrate various knowledge domains into their teaching (Sancar, et al., 2021).

Within the study of evaluating TPD programs, the TPACK framework has been extensively documented in the literature (Bustamante, 2020). Research indicates that teachers trained in TPACK exhibit greater confidence, creativity, and adaptability in their instructional practices (Chaipidech et al., 2021). Koehler and Mishra (2008) emphasize the importance of involving teachers in authentic tasks during workshops, as these activities allow them to experiment with technology in subject-specific contexts. Studies have identified hands-on workshops and personalized consultations as effective strategies to develop TPACK through professional development programs. These strategies provide active learning experiences, enabling participants to explore the interplay between technology, pedagogy, and content knowledge (Crosthwaite et al., 2021; Hu et al., 2022; Kong & Lai, 2022).

In addition to advancing competencies in the TPACK framework, TPD must also address emerging competencies such as AI literacy, self-efficacy, and metacognition. For example, increasing numbers of professional development courses are focused on enhancing educators' AI literacy to meet the demands of an AI-saturated era (Gašević et al., 2023; Kong et al., 2024; Kong & Hu, 2025). These programs not only explore AI's unique capabilities but also foster an understanding of underlying algorithms and challenges, including ethical dilemmas, misinformation, AI hallucinations, and the complexities of human-AI collaboration (Casal-Otero et al., 2023; Du et al., 2024; Kong & Zhu, 2025). Consequently, TPD supports teachers in recognizing AI's potential to enhance instructional strategies while cultivating higher-order thinking skills such as critical thinking, problem-solving, and self-regulation in the context of AI implementation (Ilgun Dibek et al., 2025;). Furthermore, increasing attention is being paid to teachers' AI competency and self-efficacy, with scales being developed to assess and enhance this crucial skill (Chiu et al., 2025; Yao & Wang, 2025). To summarize, these studies emphasize the importance of empowering teachers to confidently and effectively select and utilize AI tools in authentic learning environments. This, in turn, leads to more engaging instruction and improved teaching outcomes (Yang et al., 2024).

However, the effectiveness of TPD largely depends on its design, particularly the inclusion of interactive and collaborative components to actively engage participants (Sancar et al., 2021). One persistent challenge to the success of TPD programs lies in the "one-size-fits-all" approach, which often fails to integrate subject-specific knowledge with AI tools or provide open access to teaching and practice materials for authentic classroom contexts. To address this gap, this study designed a customized AI chatbot for teaching scenery description, providing teachers with a valuable resource that can be implemented in authentic teaching contexts. This study aims to answer the following research questions:

RQ1: Do the subject-specific professional development workshops significantly improve in-service Chinese primary school teachers' TPACK (including CK, PCK, TCK, and overall TPACK) in Hong Kong?

RQ2: To what extent do the workshops enhance teachers' metacognition skills, AI literacy, and self-efficacy in using AI tools for authentic teaching practices?

3. Methodology

3.1. Participants and instruments

This study involved two professional development (TPD) workshops designed for in-service Chinese primary school teachers in Hong Kong. Each workshop was conducted in a face-to-face format and lasted two hours. During the sessions, an expert introduced the functionality of a customized AI chatbot specifically designed to teach primary school students how to describe scenes. The AI chatbot is built on GPT-4.1 as the base model and utilizes the Flowise AI platform. It is designed to assist elementary students in learning how to write vivid scenery descriptions. By analyzing their text, the chatbot provides friendly suggestions and step-by-step guidance to help students improve their writing with rich imagery and appropriate language, all delivered in a gentle and encouraging tone. Additionally, the chatbot development incorporates local official education guidelines and materials as part of its Retrieval-Augmented Generation (RAG) process.

The workshops also included training on AI literacy, equipping teachers with an understanding of the underlying algorithms of AI and fostering a critical perspective toward AI-generated information. The content of the TPD workshops is summarized in Table 1. In this course, the AI chatbot was specifically tailored for teaching scene description, with its responses carefully designed to align with the educational objectives for primary school students. The chatbot's output was constrained to ensure it did not exceed the scope of these learning goals, while also integrating seamlessly with teacher-led instruction and student self-regulated practice. This approach allowed the chatbot to serve as a supplementary learning tool rather than encouraging dependency on AI, ensuring that students remained actively engaged in the learning process. By embedding the chatbot within this structured pedagogical framework, the course aimed to enhance students' metacognitive skills and promote their ability to learn independently.

Table 1.

The contents of teacher professional development workshops

Workshop	Topics	Surveys
Workshop 1	1. Introduction to teaching descriptive writing with AI technology. 2. Exploring Speech-to-Text techniques for descriptive writing. 3. Enhancing descriptive writing skills using AI chatbots.	(1) TPACK survey (pre-course) (2) Al literacy survey (pre-course) (3) Metacognition survey (pre-course)

	4. Understanding the role of AI in education: unleashing human potential rather than replacing students' learning in Chinese writing.	(4) Self-efficacy survey (pre-course)
Workshop 2	1. Understanding Generative AI and Large Language Models. 2. Introduction to effective prompt design. 3. Teaching prompt engineering for subject-specific learning. 4. Exploring the ethical use of AI in education.	(1) TPACK survey (post-course) (2) Al literacy survey (post-course) (3) metacognition survey (post-course) (4) Self-efficacy survey (post-course)

The first workshop, attended by 144 teachers, was followed by a second workshop two weeks later, which included 137 participants. At the start of the first workshop, teachers completed a pre-course 5-likert survey assessing four areas: their TPACK knowledge (12 items), skills for development metacognition of students (10 items), AI literacy (6 items), and self-efficacy in using AI in teaching practices (8 items). The post-course, featuring the same set of questions, was administered at the conclusion of the second workshop. Among them, we received 102 responses on TPACK and skills for development metacognition of students, and 127 responses on AI literacy and self-efficacy.

Table 2.

Reliability analysis of Chinese teacher survey

Items		**Cronbach's Alpha**
TPACK domains	CK	0.875
	PCK	0.896
	TCK	0.884
	TPACK	0.908
	Overall	0.950
Metacognition		0.959
AI Literacy		0.932
Self-efficacy		0.947

These instruments place additional emphasis on assessing whether teachers, through workshops, can develop an understanding of how to enhance students' metacognition. For instance, in the TPACK framework, the item *"I understand the uncertainty in the content generated by AI chatbots and can leverage this characteristic to facilitate students' self-regulated learning"* under the TPK construct highlights the importance of helping teachers comprehend the inherent uncertainty in AI-generated content while enabling students to develop self-regulation in their learning processes. Similarly, within the AI literacy instrument, the focus is on evaluating whether teachers have acquired concrete skills to effectively utilize AI chatbots in the classroom. For example, the item *"I have various ways and strategies for refining prompts when using AI chatbots"* measures the extent to which the instrument equips teachers with practical capacities to interact with AI and incorporate it into teaching practices. Lastly, in the self-efficacy instrument, the item *"I can guide my students to cross-verify the information generated by AI chatbots in various ways"* is designed to assess whether

teachers have the ability to guide students in critically evaluating and validating AI-generated information, thereby fostering higher-order cognitive skills.

A reliability analysis was conducted to assess the internal consistency of the survey instrument for its different sections. Cronbach's alpha was used as the measure of reliability. The results of the reliability analysis for each section are presented in Table 2. The reliability analysis demonstrated good internal consistency for the survey instrument, with a Cronbach's alpha exceeding the acceptable threshold of 0.70. This suggests that the items within the survey are measuring the intended constructs reliably.

3.2. Data analysis

This study assessed normality using the Shapiro-Wilk test and visual inspection of Q-Q plots for all variables. While the Shapiro-Wilk test indicated significant deviations from normality for some variables ($p<0.05$), the Q-Q plots showed data points closely following the diagonal line, suggesting approximate normality. Given the large sample size (n=102) and the robustness of t-tests to minor normality violations, this study proceeded with the t-tests. This study employed a paired-sample t-test to examine participants' improvements in four key areas: TPACK, metacognition, AI literacy, and self-efficacy. The paired-sample t-test was chosen to compare participants' pre-workshop and post-workshop scores, allowing for an analysis of changes within the same group over time. By focusing on these constructs, the study aimed to evaluate the effectiveness of two teacher professional development workshops in enhancing educators' knowledge, skills, and confidence in integrating technology, artificial intelligence, and reflective practices into their teaching.

4. Results

The following section shows the paired-sample t-test result of this study across the measured domains. The detailed analysis results are shown in table 3 below. The analysis of TPACK components reveals significant improvements across all domains other than CK. While CK showed a slight increase in mean scores from 4.12 (SD = 0.43) to 4.20 (SD = 0.49), this difference was not statistically significant ($t = -1.66$, $p = 0.1$). In contrast, PCK and TCK displayed significant improvements. Specifically, PCK increased from 3.49 (SD = 0.67) to 3.94 (SD = 0.58), with a highly significant improvement ($t= -6.28$, $p < 0.001$). Similarly, TCK improved from 3.77 (SD = 0.56) to 4.09 (SD = 0.58 ($t= -5.42$, $p < 0.001$). The overall TPACK construct also improved significantly, with mean scores increasing from 3.50 (SD = 0.69) to 3.93 (SD = 0.65) ($t= -6.12$, $p < 0.001$).

Table 3:

Paired-sample t-test results of in-service Chinese teachers

		Mean (pre-test)	SD (pre-test)	Mean (post-test)	SD (post-test)	t	df	p
TPACK	CK	4.12	0.43	4.20	0.49	-1.66	110	0.1
	PCK	3.49	0.67	3.94	0.58	-6.28	110	<0.001
	TCK	3.77	0.56	4.09	0.58	-5.42	110	<0.001
	TPACK	3.50	0.69	3.93	0.65	-6.12	110	<0.001
Metacognition		3.76	0.50	3.95	0.55	-3.38	126	<0.001
AI Literacy		3.31	0.63	3.82	0.64	-8.25	126	<0.001
Self-efficacy		3.09	0.69	3.77	0.60	-10.54	126	<0.001

Metacognition showed a significant improvement from a pre-test mean of 3.76 (SD = 0.50) to a post-test mean of 3.95 (SD = 0.55). The observed increase ($t= -3.38$, $p < 0.001$) indicates that the workshops had a statistically significant positive impact on the teachers' metacognitive abilities. Additionally, AI literacy demonstrated one of the most notable improvements in this study, with the mean score increasing from 3.31 (SD = 0.63) to 3.82 (SD = 0.64). The t-value of -8.25 and a p-value of < 0.001 suggest a significant enhancement in participants' understanding and application of AI

concepts because of the workshops. Self-efficacy experienced the largest improvement among all constructs, with the mean score rising from 3.09 (SD = 0.69) to 3.77 (SD = 0.60). The t-value of -10.54 and a p-value of < 0.001 indicate that the workshops had a profound and statistically significant effect on teachers' confidence in their abilities.

In summary, the results indicate significant improvements in PCK, TCK, overall TPACK, metacognition, AI literacy, and self-efficacy following the professional development workshops. CK was the only construct that did not demonstrate a significant change. These findings highlight the effectiveness of the workshops in enhancing teachers' professional competencies, particularly in areas related to technology integration, reflective practice, and confidence in teaching.

5. Discussion

This study contributes to the teacher development scholarship by both corroborating established insights and introducing novel dimensions to understanding effective TPD for AI-integrated instruction. The results validate the efficacy of structured, hands-on TPD interventions (Bustamante, 2020; Chaipidech et al., 2021), the workshops yielded statistically significant improvements in teachers' PCK, TCK, overall TPACK, and self-efficacy, affirming the TPACK framework's central role in guiding technology-enhanced teacher training. Additionally, the emphasis on context-specific practice via a tailored AI chatbot for scene description teaching aligns with the existing literature (Crosthwaite et al., 2021; Hu et al., 2022), who identified subject-aligned active learning as critical for developing TPD. Most importantly, this model not only facilitates the effective integration of AI tools into classroom practices but also enhances teachers' confidence in supporting students' learning with AI. This focus on teacher capacity-building highlights the importance of aligning AI-driven innovations with subject-specific instructional goals and learner-centered approaches, ultimately fostering teachers' professional growth.

These divergences yield important theoretical and practical implications. Theoretically, they highlight the need to conceptualize teacher professional development as a holistic process that encompasses metacognition and AI literacy, rather than limiting it to core knowledge domains. Additionally, this study focuses on foundational constructs and contextualized design, advancing a more comprehensive model of TPD in AI-enhanced language education, not only supporting the integration of AI technologies but also fosters the development of students' metacognitive skills.

6. Conclusion and Future Research

This study evaluated the impact of customized TPD workshops, incorporating a subject-specific AI chatbot for teaching scene description, on in-service Chinese primary school teachers in Hong Kong. Paired-sample t-test results revealed statistically significant improvements in teachers' PCK, TCK, overall TPACK, metacognition, AI literacy, and self-efficacy. In contrast, CK showed only a marginal, non-significant increase, which is likely due to teachers' pre-existing subject proficiency. These findings address critical gaps in TPD scholarship, moving beyond "one-size-fits-all" models and demonstrating that subject-specific, interactive TPD effectively enhances not only core TPACK competencies but also understudied skills (metacognition, AI literacy) critical to sustainable technology integration. Practically, the results highlight the value of integrating domain-specific AI tools in TPD and tailoring focus areas to teachers' existing competencies. Limitations of the current study include its focus on Hong Kong Chinese primary school teachers and a single AI chatbot application, which restricts the generalizability of the results to other disciplines and cultural contexts. Future research should expand to a diverse teacher sample and explore long-term impacts on classroom practices and student outcomes, as well as the mechanisms linking AI literacy, metacognition, and self-efficacy to TPACK development. The second limitation is that this study was based on the comparison of pre and post-test of a single group without a control group. Future studies are suggested to examine the effects of intervention with a control group and other statistical evidence. The third limitation is that the intervention of this study lasted only four hours, future studies are suggested to examine the long-term effects on teachers' TPACK progression.

Acknowledgements

The authors would like to acknowledge the project "Using Artificial Intelligence (AI) in Primary School Education to Unleash Potential of Primary Students in Five Subjects: Chinese Language, English Language, Mathematics, Primary Science, and Primary Humanities" with the funding support from the Teaching Development Grant 2025-28 triennium, The Education University of Hong Kong.

References

Bustamante, C. (2020). TPACK-based professional development on web 2.0 for Spanish teachers: a case study. *Computer Assisted Language Learning, 33*(4), 327–352. https://doi.org/10.1080/09588221.2018.1564333

Casal-Otero, L., Catala, A., Fernández-Morante, C., Taboada, M., Cebreiro, B., & Barro, S. (2023). AI literacy in K–12: A systematic literature review. *International Journal of STEM Education, 10*(1), 29. https://doi.org/10.1186/s40594-023-00418-7

Chaipidech, P., Kajonmanee, T., Chaipah, K., Panjaburee, P., & Srisawasdi, N. (2021). Implementation of an andragogical teacher professional development training program for boosting TPACK in STEM education. *Educational Technology & Society, 24*(4), 220–239. https://www.jstor.org/stable/48629257

Chiu, T. K. (2025). Responsible digital citizen: building AI ethics awareness across subjects. *Interactive Learning Environments*, *33*(4), 2759–2761. https://doi.org/10.1080/10494820.2025.2494914

Chiu, T. K., Ahmad, Z., & Çoban, M. (2025). Development and validation of teacher artificial intelligence (AI) competence self-efficacy (TAICS) scale. *Education and Information Technologies, 30*(5), 6667–6685. https://doi.org/10.1007/s10639-024-13094-z

Collie, R. J., Martin, A. J., & Gasevic, D. (2024). Teachers' generative AI self-efficacy, valuing, and integration at work: Examining job resources and demands. *Computers and Education: Artificial Intelligence, 7*, 100333. https://doi.org/10.1016/j.caeai.2024.100333

Crosthwaite, P., Luciana, & Wijaya, D. (2021). Exploring language teachers' lesson planning for corpus-based language teaching: A focus on developing TPACK for corpora and DDL. *Computer Assisted Language Learning, 36*(7), 1392–1420.https://doi.org/10.1080/09588221.2021.1995001

Dogan, S., Nalbantoglu, U. Y., Celik, I., & Agacli Dogan, N. (2025). Artificial intelligence professional development: A systematic review of TPACK, designs, and effects for teacher learning. *Professional Development in Education*, *51*(3), 519–546. https://doi.org/10.1080/19415257.2025.2454457

Du, H., Sun, Y., Jiang, H., Islam, A. Y. M., & Gu, X. (2024). Exploring the effects of AI literacy in teacher learning: An empirical study. *Humanities and social sciences communications, 11*(1), 1-10. https://doi.org/10.1057/s41599-024-03101-6

Gašević, D., Siemens, G., & Sadiq, S. (2023). Empowering learners for the age of artificial intelligence. *Computers and education: artificial intelligence, 4*, 100130. https://doi.org/10.1016/j.caeai.2023.100130

Hu, C. C., Yeh, H. C., & Chen, N. S. (2022). Teacher development in robot and IoT knowledge, skills, and attitudes with the use of the TPACK-based Support-Stimulate-Seek approach. *Interactive Learning Environments, 31*(9), 5811–5830.https://doi-org.ezproxy.eduhk.hk/10.1080/10494820.2021.2019058

Ilgun Dibek, M., Sahin Kursad, M., & Erdogan, T. (2025). Influence of artificial intelligence tools on higher order thinking skills: A meta-analysis. *Interactive Learning Environments*, *33*(3), 2216–2238. https://doi-org.ezproxy.eduhk.hk/10.1080/10494820.2024.2402028

Koh, J. H. L., Chai, C. S., & Lim, W. Y. (2017). Teacher Professional Development for TPACK-21CL: Effects on Teacher ICT Integration and Student Outcomes. *Journal of Educational Computing Research*, *55*(2), 172–196. https://doi.org/10.1177/0735633116656848

Kong, S. C., & Hu, W. (2025). A study of developing administrative staff's conceptual understanding of generative artificial intelligence through professional Development: Evaluation of a course using tests, surveys and thematic analysis of reflective writings. *Computers and Education: Artificial Intelligence, 9*, 100444. https://doi.org/10.1016/j.caeai.2025.100444

Kong, S. C., & Lai, M. (2022). A proposed computational thinking teacher development framework for K-12 guided by the TPACK model. *Journal of Computers in Education*, *9*(3), 379–402. https://doi.org/10.1007/s40692-021-00207-7

Kong, S. C., & Yang, Y. (2024). A human-centered learning and teaching framework using generative artificial intelligence for self-regulated learning development through domain knowledge learning in K–12 settings. *IEEE Transactions on Learning Technologies, 17*, 1562–1573. https://doi.org/10.1109/TLT.2024.3392830

Kong, S. C., & Zhu. J. (2025). Developing and validating an artificial intelligence ethical awareness scale for secondary and university students: Cultivating ethical awareness through problem-solving with artificial intelligence tools. *Computers and Education: Artificial Intelligence*, 100447. https://doi.org/10.1016/j.caeai.2025.100447

Kong, S. C., Yang, Y., & Hou, C. (2024). Examining teachers' behavioural intention of using generative artificial intelligence tools for teaching and learning based on the extended technology acceptance model. *Computers and Education: Artificial Intelligence, 7*, 100328. https://doi.org/10.1016/j.caeai.2024.100328

Mishra, P., & Koehler, M. J. (2008, March). *Introducing technological pedagogical content knowledge.* Paper presented at the Annual meeting of the American Educational Research Association, New York City.

Mishra, P., & Koehler, M.J. (2006). Technological pedagogical content knowledge: A framework for integrating technology in teacher knowledge. *Teachers College Record, 108*(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Ning, Y., Zhou, Y., Wijaya, T. T., & Chen, J. (2022). Teacher Education Interventions on Teacher TPACK: A Meta-Analysis Study. *Sustainability*, *14*(18), 11791. https://doi.org/10.3390/su141811791

Sancar, R., Atal, D., & Deryakulu, D. (2021). A new framework for teachers' professional development. *Teaching and teacher education*, *101*, 103305. https://doi.org/10.1016/j.tate.2021.103305

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational researcher*, *15*(2), 4–14. https://doi.org/10.3102/0013189X015002004

Yang, Y. F., Tseng, C. C., & Lai, S. C. (2024). Enhancing teachers' self-efficacy beliefs in AI-based technology integration into English speaking teaching through a professional development program. *Teaching and Teacher Education*, *144*, 104582. https://doi.org/10.1016/j.tate.2024.104582

Yao, N., & Wang, Q. (2024). Factors influencing pre-service special education teachers' intention toward AI in education: Digital literacy, teacher self-efficacy, perceived ease of use, and perceived usefulness. *Heliyon, 10*(14). http://doi.org/10.1016/j.heliyon.2024.e34894