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The Impact of AI Literacy on Teacher Efficacy and Identity: A Study of Korean English Teachers

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Abstract: This study investigates the relationships among AI literacy, teacher efficacy, and professional identity among English teachers in Korea's EFL context. As AI increasingly integrates into educational environments, it is crucial to understand how these factors interplay in shaping teachers' professional identities. The findings suggest that fostering AI literacy can significantly enhance teachers' sense of professionalism and efficacy, thereby reinforcing their unique roles in the AI era. However, the initial study's limited sample size necessitates ongoing research with a larger cohort to validate these results. Future studies should aim to refine research tools, expand sample sizes, and explore AI literacy development strategies tailored to different career stages and generations. Such efforts will contribute to a more comprehensive understanding of AI's impact on education and offer practical insights for teacher development in an AI-driven world.

Keywords: AI literacy, teacher efficacy, professional identity, English teachers, EFL, teacher development, AI in education

1. Introduction

As classrooms increasingly focus on real communication, the role and identity of teachers have become increasingly crucial. Teachers are no longer mere transmitters of knowledge, nor are they simply one-way instructors. They now should take on the role of timely supporters and facilitators of students' language learning (Kim, 2018). In the context of communicative language teaching, teachers are expected to provide diverse tasks and activities that enable students use language in authentic situations. For teachers to effectively fulfill their roles, they must continuously reflect on their identities, striving to develop their professional competence.

The advent of artificial intelligence, particularly large language models like ChatGPT, has precipitated a significant shift in English education, compelling teachers to reassess their roles and professional identities. ChatGPT's ability to provide personalized feedback, facilitate practices, perform automated grading, and offer near-human-level translations has revolutionized various aspects of English teaching (Lee, 2019; Shin, 2019; Son, 2023). Unlike traditional classroom settings where teachers struggle with individual assessment due to large class sizes, AI can analyze divers, real-time data from learners to provide personalized feedback.

This technological leap has raised concerns about the diminishment or replacement of the teachers' role. Lee (2020) investigated English teachers' and pre-service teachers' perceptions of the future of English education. While most teachers recognized the need for evolving their roles and enhancing their technological knowledge, they also expressed anxiety about technological advancements. Therefore, there is pressing need for teachers to effectively use AI technologies while redefining their unique roles that cannot be replicated by AI (Zawacki-Richter et al., 2019; Salvati et al., 2023). This underscores the growing importance of AI literacy among English teachers, as the ability to understand, utilize, and integrate these technologies becomes increasingly important in maintaining the efficacy and professional identity in the evolving landscape of future English language education.

Recent research suggest that teachers' AI literacy can significantly influence their professional identity and self-efficacy (Velander et al., 2024). Teachers with higher AI literacy tend to exhibit a more positive and confident self-image as educators. They are more likely to view their understanding of AI as a tool to enhance their teaching practices. Personalize learning experiences, and improve educational outcomes. Moreover, they are better equipped to guide students in developing critical thinking, problem-solving, and digital literacy skills needed for an AI-driven future. Consequently, they may define themselves as fulfilling educators preparing student for the challenges and opportunities of the 21st century. However, teachers with lower AI literacy may perceive AI as a potential threat that could replace their role, leading to decreased self-efficacy and resistance to integrating AI in the classroom. When teachers can confidently harmonize their technological knowledge with their educational expertise, they can strengthen their professional identity and deliver high-quality instruction. In other words, AI literacy, alongside with pedagogical knowledge, can affect teacher identity.

Although the impact of AI on English education has been studied, less attention has been paid to how English teachers' AI literacy affects their sense of efficacy and professional identity. While it has been shown that AI tolls can benefit English language learning, we know less about teachers' perceptions. The way teachers perceive and interact with AI may also tell us something about their self-awareness of their role as educators in the AI era. In this context, research on how English teachers perceive and construct their teacher efficacy and identity based on their AI literacy is crucial. Such research will provide important insights into how English teachers effectively integrate and utilize technological tools. Furthermore, it can contribute to addressing teachers' anxieties about AI based teaching and help develop support systems necessary for teachers to adapt to and embrace theses technological changes.

This study aims to investigate the relationship between AI literacy, teacher efficacy, and teacher identity among English teachers in Korea EFL(English as Foreign Language) context. As AI becomes more prevalent in educational settings, not only the teacher self-efficacy but also teachers' AI literacy may significantly influence their sense professional identity. I propose the following research questions:

1. How does Korean English teacher efficacy literacy influence teacher professional identity?
2. How does Korean English teacher AI literacy moderate the relationship between teacher efficacy and teacher professional identity?
3. What are the interactions among AI literacy, teacher efficacy, and teacher professional identity?

2. Method

2.1 Participants

Our study employs a mixed-methods approach, combining quantitative measures with qualitative interviews to provide a comprehensive understanding of the relationships between AI literacy, teacher efficacy, and teacher identity. We recruited 25 Korean English teachers working in elementary, middle, or high schools through online teacher communities. All participants voluntarily agreed to participate in the study.

2.2 Instruments

To address our research questions, a quantitative approach using validated measurement instruments for teacher identity, self-efficacy, and AI literacy based on the AI-TPACK model was employed. First of all, for the teacher professional identity, Questionnaire on Perceived Professional Identity among Teachers (QIPPE) developed by Lentillon-Kaestner et al. (2018) was used. This instrument consisted of two components: a) Pedagogical expertise: This factor reflects a teacher's perceived competence in instructional methods and classroom

management, b) Subject matter expertise: This factor represents a teacher's confidence in their knowledge of the subject they teach.

For the Teacher Self-Efficacy. the survey conceived and developed by Gibson and Dembo, which evaluates two distinct factors was used. a) Personal Teaching Efficacy: This factor aligns with Bandura's self-efficacy dimension and reflects a teacher's confidence in their skills and abilities to facilitate student learning. b) Teaching Efficacy: This factor corresponds to Bandura's outcome expectancy dimension and gauges a teacher's beliefs about the general relationship between teaching and learning.

For the AI Literacy, it was assessed by AI literacy using the AI-TPACK model, which included the following components: a) TK (AI-Technological Knowledge): This factor relates to a teacher's foundational understanding of AI and reflects their ability to comprehend and operate AI technologies applicable to education. b) TCK (Technological Content Knowledge): This factor is associated with a teacher's capacity to integrate AI with subject matter and represents their knowledge of how to transform educational content through AI technology to enhance student understanding. c) TPK (AI-Technological Pedagogical Knowledge): This factor connects to a teacher's instructional strategies with AI and demonstrates their understanding of how to leverage AI technology to create optimal learning conditions and engage students effectively. d) TPACK (AI-Technological Pedagogical Content Knowledge): This factor embodies the synthesis of all previous components and signifies a teacher's comprehensive expertise in representing subject content through AI technology in educationally meaningful ways, fostering conducive learning environments, and engaging learners effectively.

2.3 Interview

To explore the intricate relationships between teacher identity, teacher efficacy, and AI literacy, we conducted in-depth interviews with three teachers. The semi-structured interviews focused on the following key areas:

The impact of generative AI use on teachers' perceptions of professional competence and efficacy("How has the knowledge and skills acquired through generative AI contributed to your teacher efficacy?"). The role of each TPACK model component in teacher efficacy("How did each component of the TPACK model (TK, PK, CK, TPCK, TPACK) contribute to your teacher efficacy?"). Changes in teacher identity resulting from experiences with generative AI("How has your experience with generative AI changed your identity as a teacher?"). Key factors that either facilitate or hinder teacher growth and development through the use of generative AI("What do you consider to be the most important factor in growing and developing as a teacher through your experience with generative AI?").

3. Results

3.1 Quantitative results

Our study investigated the impact of AI literacy on teacher efficacy and identity in the era of generative AI in English education. Descriptive statistics reveal that teacher identity components showed high mean values (Pedagogical Expertise: $M = 4.27$, $SD = 0.469$; Subject Matter Expertise: $M = 4.18$, $SD = 0.430$). Teacher efficacy measures displayed more variation, with Personal Teaching Efficacy ($M = 3.69$, $SD = 0.483$) scoring higher than Teaching Efficacy ($M = 2.68$, $SD = 0.562$). AI literacy components (AI-TPACK) showed moderate to high mean values: TK ($M = 3.29$, $SD = 0.796$), TCK ($M = 3.19$, $SD = 0.983$), TPK ($M = 3.45$, $SD = 0.891$), and TPACK ($M = 3.33$, $SD = 0.873$). These results indicate generally high perceptions of teacher identity and AI literacy, with more variability in teaching efficacy. Shapiro-Wilk tests confirmed normal distribution for all variables ($p > 0.05$), validating the use of parametric statistical analyses in our study.

Pearson correlation analyses, conducted due to the normality of all variables, revealed varying relationships between key variables. A positive correlation between teacher identity

and teacher efficacy ($r = 0.359$) was observed, though not statistically significant ($p = 0.078$). AI literacy showed a moderate, statistically significant positive correlation with teacher identity ($r = 0.512$, $p < 0.05$), suggesting that higher AI literacy is associated with stronger teacher identity. The relationship between AI literacy and teacher efficacy exhibited a weak positive correlation ($r = 0.283$) but lacked statistical significance ($p = 0.170$). It's noteworthy that the absence of statistical significance in some correlations may be attributed to the study's small sample size. Additional data collection and analysis could potentially enhance statistical power and reveal more definitive relationships among these variables.

Moderation analysis revealed that AI literacy significantly influences pedagogical expertise and teacher identity, but the interaction effect between teacher efficacy and AI literacy was not significant for either outcome. Neither teacher efficacy nor AI literacy significantly affected subject matter expertise, and their interaction effect was also not significant. These findings suggest that while enhancing AI literacy may be crucial for improving teachers' pedagogical expertise and overall identity, the combined effect of AI literacy and teacher efficacy does not provide additional benefits beyond their individual impacts. The lack of significant effects on subject matter expertise indicates that other factors may need to be considered or further research is required to understand influences on this aspect of teacher identity. These results underscore the importance of AI literacy in teacher education and imply that systematically improving teachers' AI literacy through educational programs and training could be a key strategy for developing teacher identity in the AI era.

3.2 Qualitative results

The introduction of generative AI has significantly impacted teachers' perceptions of their professional competence and efficacy. While AI enhances work efficiency, it also prompts teachers to reevaluate their roles and expertise. The TPACK model's components, particularly technological knowledge (TK), contribute positively to teacher efficacy. Teachers with strong technological skills reported higher efficacy in AI utilization and were more likely to participate in training programs as instructors. The interplay between teacher efficacy and technological knowledge (TK) appears to strengthen teacher identity, with TK expanding the scope of possible teaching activities. However, in the context of English education, there were concerns that AI's efficient feedback systems might challenge teachers' unique identity, given the subject's emphasis on linguistic communication skills.

The experience of using generative AI has led to a polarization in teacher identity. Teachers who actively employ AI report increased efficiency and effectiveness in various educational activities. Conversely, those who seldom use AI tend to limit its application to essential tasks only. This divide underscores the importance of learning to use generative AI effectively for teacher growth. Participation in frequent training sessions and engaging in collaborative learning communities were identified as crucial for lowering barriers to AI adoption. Conversely, misuse or complete avoidance of AI was seen as detrimental to professional growth.

Pre-existing technological proficiency appears to correlate with higher efficacy in AI utilization. Teachers who were already adept with computer technology demonstrated greater confidence in leveraging AI tools. This trend extends to their involvement in various training programs and leadership roles in AI education initiatives. In the specific context of English education, while AI's vast data-driven capabilities were acknowledged as beneficial, concerns were raised about its potential to diminish the unique role of teachers in fostering communicative competence. These findings highlight the need for balanced professional development that enhances AI literacy while preserving the irreplaceable aspects of human teaching in language education.

4. Discussion

Our study investigated the impact of AI literacy on teacher efficacy and identity in the era of generative AI in English education, the moderating effect of AI literacy on the relationship

between teacher efficacy and identity, and the interactions among AI literacy, teacher efficacy, and teacher identity. We conducted surveys and semi-structured interviews covering teacher identity, teacher efficacy, and AI literacy based on the AI TPACK model.

Our findings suggest that developing AI literacy plays a crucial role in enhancing teacher professionalism and identity in the AI era. The positive impact of AI literacy on pedagogical expertise and identity underscores the importance of integrating AI-related skills into teacher education programs. The positive influence of TPACK components, especially technological knowledge, on teacher efficacy aligns with previous research and reinforces the importance of comprehensive technological training for teachers. The correlation between pre-existing technological skills and AI efficacy suggests that building a strong foundation in educational technology can facilitate the adoption of AI tools.

The non-significant effect of AI literacy and teacher efficacy on subject matter expertise-related identity is intriguing. This may suggest that teachers perceive their subject knowledge as distinct from their technological skills, highlighting the need for further research on integrating AI literacy with content knowledge. The mixed effects of generative AI use on teacher professionalism reflect the complex nature of AI integration in education. While AI enhances efficiency, it also prompts a reevaluation of teacher roles, emphasizing the need for professional development that addresses both the technical and philosophical aspects of AI in education.

5. Conclusion

This study implies that fostering AI literacy among teachers can significantly contribute to the development of their professionalism and identity in the AI era. Systematic enhancement of teachers' AI literacy through education programs and training is necessary. This can help teachers effectively utilize AI technologies to support student learning while redefining their unique value and roles that cannot be replaced by AI.

It's important to note that due to the initial small sample size, we are currently conducting a follow-up study with a larger sample of 60 participants, using a validated questionnaire. This ongoing research is expected to yield more definitive results, providing a clearer picture of the relationships between AI literacy, teacher efficacy, and teacher identity.

Future research in this area should focus on several key aspects to build upon and extend the current findings. These include enhancing the reliability and validity of research tools through expert validation, further increasing the sample size to improve statistical generalizability, and considering differences in teachers' career stages and generations. Additionally, exploring specific strategies for developing AI literacy to enhance teacher identity and efficacy will be crucial. These future directions will contribute to a more comprehensive understanding of AI literacy in education and provide practical guidance for teacher development in the AI era. By addressing these areas, researchers can develop a more nuanced and actionable body of knowledge to support teachers in navigating the challenges and opportunities presented by AI in education.

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