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Teachers' AI Education Programs: Comparative Study of US and South Korea

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Abstract

This study compares K–12 AI education programs for teachers in the U.S. and South Korea using qualitative content analysis on ten documents (2020–2025) across macro, meso, and micro levels. Both countries stress AI ethics and literacy for digital citizenship and workforce readiness. Key differences emerge from contrasting educational systems: South Korea's centralized system offers structured, curriculum-aligned guidance and tool-specific training, while the decentralized U.S. system provides broader frameworks for local adaptation and stakeholder involvement. Instructionally, U.S. materials frame teachers as facilitators, whereas South Korean programs position them as learners developing practical competencies. The study highlights how sociopolitical contexts shape teacher AI education and suggests combining structured guidance with local flexibility to support teachers' AI literacy.

Key words

Teacher Professional Development, Teacher AI Literacy, Comparative Education, AI in Education

Introduction

This paper is a comparative analysis of Artificial Intelligence (AI) education programs and guidelines targeting teachers, in the US and South Korea. Employing content analysis at varying levels,—macro, meso, and micro—the paper aims to holistically comprehend the similarities and differences between US and South Korean AI education for teachers and to explore social and educational settings that affect them.

There is an exponential growth in the use of AI in education. The World Economic Forum (2025) shows that the AI education market will grow by approximately 22 times, from \$5.18 billion in 2024 to \$112.3 billion by 2034 (para. 1). However, K-12 teachers are not yet ready to keep up with the trend to implement AI with confidence. According to Diliberti et al. (2024, p.3), “66% of US K-12 teachers are non-AI users”. Even among teachers who use AI, the majority do so simply because it is provided or recommended by others. Korean Educational Development Institute (KEDI)’s research in 2024 also indicates a similar trend; 67.6% of K-12 teachers are not actively using nor have they heard about AI tools for education (Baek, 2024). This leads to teachers’ perception and readiness to use AI in education. Only 6% of American K-12 teachers perceive AI as beneficial, and 35% have no opinions on AI (Lin, 2024, para. 2).

While many South Korean teachers agree on the use of AI in education, they do not feel well prepared due to the complex management of devices and platforms, as well as the challenges and fatigue that comes with learning new AI tools and strategies. The data imply the importance of AI literacy education for teachers. Many studies have pointed out that there is a lack of an AI literacy framework and education for K-12 teachers (Nazaretsky et al., 2022; Ng et al., 2021), despite the need for effective AI use by teachers to nurture the next generation (Ding

et al., 2024; Du et al., 2024; Ryu & Han, 2018). Thus, this content analysis of AI education and guidance for teachers will address the following questions:

- (a) What are the stated goals and contents of AI education training programs and guidance for teachers?
- (b) What are the similarities and differences in macro/meso/micro levels in relation to each country's educational settings?

Literature Review

Teacher PD AI Framework

Long and Magerko (2020) defined AI literacy as “a set of competencies that enables individuals to critically evaluate AI technologies; communicate and collaborate effectively with AI; and use AI as a tool online, at home, and in the workplace” (p. 2). Going further, Allen and Kendeou (2024) proposed the ED-AI Lit structure, emphasizing the importance of contextualizing AI across diverse fields and understanding how AI affects discussion about bias, fairness, and transparency (p.8). There have been efforts to apply AI literacy targeting teachers. For instance, Ng et al. (2021) introduced the AI literacy Technological, Pedagogical, and Content Knowledge (TPACK) framework, tailoring learning artifacts, pedagogies, and instructional contents to AI tools. Nazaretsky et al. (2022) recommended making teacher AI training programs to cover the basics of AI mechanism and be more relevant and practical for teachers to use (p. 928). This connects to Zhang et al. (2024)'s study that shows the successful teacher-led Developing AI Literacy (DAILY) initiative. However, there is an absence of concrete suggestions and strategies for teachers to try, as well as acknowledging how various shareholders around

education will be part of this change; not only teachers and students but school and district administration and sociopolitical circumstances that affect AI's development.

Comparative Study of AI Education for Teachers

Since the use and impact of AI tools have become increasingly ubiquitous, it is essential to understand how they are being used on a global scale, identifying similarities and differences and which contexts are influencing them. There have been some comparative studies on AI education and curriculum on a global scale (Erümit et al., 2024; Lee, 2020; Zhou et al., 2022). However, literature on teacher AI professional development programs is primarily conducted internally within a country (Du et al, 2024; Lee et al., 2024; Park & Han, 2024; Zhang & Zhang, 2024) or skewed towards the US and European countries (Lucas et al., 2025; Sperling et al., 2024). The US and South Korea were chosen for this study as they differ significantly in population—students and teachers—and educational systems.

Unlike the US where schools are run by each state and district, South Korea has a very centralized system, the Ministry of Education (MOE) is closely tied with the president's office as ministers are appointed by presidents and a standardized national curriculum that all schools must follow. I am well situated to conduct this study with a focus on the US and South Korea because I was born and raised in South Korea going through K-12 schools. I have participated in and organized TPD programs in different countries, ranging from attending a workshop for Korean language teachers to designing TPD for American and Laotian K-12 teachers. Especially since non-Eurocentric focus is demanded in the learning technologies field (Kim & Kwon, 2023; Lamrabet et al., 2025; Vermunt & Endedijk, 2011; Watted, 2025), I intend to develop TPD that holistically incorporates teachers' needs where teachers can connect and learn from each other.

Familiarity with these both contexts would be a good foundation to fill in the gap to compare teacher AI in different countries.

Methodology

According to Krippendorff (2019), content analysis is a method to analyze text in relation to certain contexts. Given the rapid development of AI tools in education, this study examines documents of teacher training programs and guidance on using AI in education. Specifically, the study employs qualitative content analysis, acknowledging that text does not have a single meaning (Krippendorff, 2019). I recognize that the way I introduce and interpret them with my own K-12 education experience in both countries might vary from how others would do it, and materials by governmental and private institutions might be distinct. In addition, the contents were categorized into macro, meso, and micro level. Adapting the educational content analysis done by Bozkurt et al. (2015), macro level refers to social aspects such as ethics and globalization. Meso level includes technology and organizations for teacher support. And micro level entails instructional design, teacher / learner characteristics. Applying this specific content analysis allows for systematic comparison to identify recurring themes and unique differences, as well as opening up future opportunities for academia to approach these guidelines in another aspect.

Ten documents—five from each country—have been selected for the analysis. Criteria used for the selection were (a) published within 2020-2025 range and (b) geared towards K-12 education and teachers. Table 1 below describes which documents were analyzed. The type of the document—training material or guideline—and publisher—governmental or private institution—was also noted but not used as selection criteria. This is because American AI education courses for teachers (US training material) and Korean training courses by private

institutions (Korean publisher type) were not accessible due to the paid subscription and I am not a licensed teacher.

Table 1

Documents Used for the Content Analysis

Country	Material Type	Publisher Type	Name	Authors (If indicated)	Publisher (Organization)	Year
US	Guideline	Private	AI Guidance for Schools Toolkit	Teach AI	Teach AI	2024
US	Guideline	Private	AI Literacy: A Framework to Understand, Evaluate, and Use Emerging Technology	Mills et al.	Digital Promise	2024
US	Guideline	Private	Review of Guidance from Seven States on AI in Education	Roschelle et al.	Digital Promise	2024
US	Guideline	Governmental	Artificial Intelligence in Education	MN Dept of Education	MN Dept of Education	2024
US	Guideline	Governmental	Framework for AI-Powered Learning Environments	NCEE	The National Center on Education	2024
Korea	Guideline	Governmental	AI 디지털교과서 선정 도움자료 / Guideance for Choosing AI Digital Textbook	Do	한국교육학술정보원 (KERIS)	2024
Korea	Training Progr...	Governmental	초등 에듀테크 AI 활용 교원 직무연수 / Elementary School Teacher PD for EduTech AI Use	Park et al.	한국교육학술정보원 (KERIS)	2021
Korea	Training Progr...	Governmental	초등 인공지능 기본 역량 강화 / Elementary School Teacher PD for AI Skill	Kang et al.	한국교육학술정보원 (KERIS)	2021
Korea	Training Progr...	Governmental	체험과 실습을 통해 이해하는 AI윤리 / AI Ethics through hands on experience	Kim & Jeong	한국교육학술정보원 (KERIS)	2022
Korea	Training Progr...	Governmental	사례를 통해 체험하는 기계학습과 AI융합교육 / Machine Learning and AI Integrated Learning Case Studies	Kim & Jeong	한국교육학술정보원 (KERIS)	2022

Findings

Similarities

There were some similarities between the two countries at the macro level. First, programs and guidelines from both countries highlighted the ethics around AI. They acknowledge the growing impact of the AI tools and the significance of using them in a safe and responsible manner. According to the Digital Promise framework, one of the core AI literacy skills that teachers should be aware of is responsible engagement “in the consumption, creation, or sharing of AI-enabled products, including ethical sourcing and citation” (Mills et al., 2024, p.7). Kang et al. (2021), stated that “responsibility around making and managing AI gets bigger as its influence gets bigger. We must ponder what kind of influence that technology makes and potential risks that we did not anticipate” (p. 197). Specifically, ethics around bias in AI generated sources were common. Teach AI (2024) mentioned the goal of the guideline is to have teachers “be more prepared to lead discussions on AI’s ethical and societal aspects, such as bias, privacy, and fairness, and promote its responsible use” (p. 16). Kim and Jeong (2022) asserted

that “Data provided to AI should be objective and ethical. But since data are selected and given by humans, it is crucial to know that developers’ personal values and bias might intervene the process” (p. 217).

The need for AI literacy in the US and South Korea was framed in relation to the new digital citizenship and workforce skill set. Mills et al. (2024) shared that “AI literacy can equip them with essential skill sets to responsibly use emerging technology for the good of society throughout their lives and in the workforce” (p. 4). Park et al. (2021) claimed that AI ethics education is necessary not only as an individual but as a virtue of citizens (p. 9). Stating the importance of AI education for students as nurturing citizenship and workforce skill for the next generation, training and guidelines emphasize the role of teachers to be aware of AI literacy and incorporate them into teaching. Likewise, both countries at the macro level address the growth of AI and its emergence as a new skill set, and they are aligned in promoting the responsible use of AI around ethics and bias.

Differences - Macro Level

The sociopolitical settings of the two countries affect the materials in different ways. South Korean documents explicitly described how training contents are aligned with the most recent 2022 revised national curriculum standards and teachers should learn how to tailor AI into them. For instance, Do et al. (2024) stated that “based on MOE's task force on enhancing AI in education, this program is designed to share ideas for integrating AI in numbers of subjects based on the national curriculum” (p. iii). In contrast, AI implementation in the US is largely determined at the district and school levels. Not all state governments and departments of education announced AI use guidance in education (Roschelle et al., 2024). Meanwhile, Mills et al. (2024) introduced several case studies on what kind of AI guidelines and teacher support

programs that schools and districts are using, stating “teacher expertise should be leveraged to fine tune broader implementation of AI tools for teaching and learning, and district policy and procedure should facilitate that” (p. 32). This clearly indicates how the education system at the macro level affects the teacher AI education. Although national policy or curriculum has not been mentioned in American sources, it would be worthwhile to see the political impact on AI education and support for teachers with the recent executive order of President Trump Advancing Artificial Intelligence Education for American Youth (2025).

The social factors that affected AI education narrated were also different. The US acknowledged the emergence of the new generation and their characteristics as digital natives as the justification of teaching AI. NCEE (2024) explained that “the incorporation of AI into popular social platforms used by Gen Z and Gen Alpha suggest that AI-driven informal learning outside of the classroom is happening faster than ever” (p. 2). Meanwhile, South Korean materials rather highlighted how COVID-19 shifted the education field and needs for AI in general. Stating that COVID-19 has made digital gap bigger (p. 14), Do et al. (2024) provided chapters to call for AI education and teachers focusing on closing the digital divide among students as well as several cases studies of using AI for COVID-19 responses.

On the other hand, some sections around the social impact of AI were distinct. American sources narrated the environmental footprint of AI and academic integrity as a core part of AI literacy to teach. Mills et al. (2024) stated that incorporating AI in teaching should “consider the benefits and/or costs of AI to individuals, society, and the environment” (p.8) and recognize how “large AI systems will likely harm our environment through unchecked energy consumption” (p. 16). Roschelle et al. (2024) covered how generative AI can be implemented in courses to a divergent extent and how to ensure academic integrity by preventing cheating and plagiarism.

And Teach AI (2024) asserted that “AI simultaneously offers staff and students an opportunity to emphasize the fundamental values that underpin academic integrity—honesty, trust, fairness, respect, and responsibility” (p. 23). South Korean data has extensive contents for teachers about the history of AI and computer science education and basics of how AI works. Claiming that many aspects of AI education share similar direction and goals (p. 3), all the data analyzed had chapters to explain history of computing and software education curriculum along with AI and its mechanisms such as Large Language Models (LLM) and deep learning.

Differences - Meso Level

At the meso level, technology used and scope of shareholders to be involved in AI education are different. American sources generally explained components of AI literacy in general and did not refer to specific AI tools, while South Korean materials organized chapters introducing a wide range of existing AI tools—from self-driving cars, AI robots for surgery, to AI job recruiter. The inclusion of more concrete technologies presented can be attributed to South Korea having a longer history of using technology in education nationwide. In South Korea, introducing digital textbooks has been discussed and studied since 1997 and officially distributed to K-12 schools from 2018 after several planning and operating pilot schools (Yoon, 2023, p. 2). This year, South Korea has nationally implemented AI digital textbooks—not only a digital version of traditional paper textbooks but has AI components to personalize learning for students—for the very first time in the world (Ministry of Education, 2023). Thus there is more data and better resources in South Korea to identify which AI platforms and tools to be incorporated in curriculum and how teachers should use them.

Regarding shareholders, America has a bigger scope of shareholders engaged in AI education. Not only teachers but staff—specific to support Information and Communication

Technology (ICT) or wireless network in the building, and just any administrative staff—were included as shareholders to be AI literate (Minnesota Department of Education, 2024; Teach AI, 2024). Mills et al. (2024) also emphasized families and communities, mentioning they need “to be aware of how AI tools are being used, and to understand the agency they have in deciding if and how they will use them to impact their lives and society” (p. 33). Meanwhile, there is no mention of staff nor community involvement in South Korean materials, but more focus of teacher-student relationship. AI digital textbook checklist entails user interface and experience and convenient communication between teachers and students (Do et al., 2024, p. 3), and all the KERIS sources are geared towards teachers only. This is because there is no designated educational technology person in the building in South Korea, which shows how the school structure affects the range of shareholders and who are narrated as a part of the AI education.

Differences - Micro Level

Teachers’ roles in AI implementation were narrated differently in the two countries. Many American sources highlighted how teachers' role needs to be reinforced as a facilitator. This is evident in Minnesota Department of Education (2024) guidance that stated “new technology innovations and disruptions make the role of teachers even more important, especially in relation to guiding students' development of critical thinking, collaboration, and application of knowledge” (p. 1). However, South Korean training programs recognize teachers as learners. Kim et al. (2022) described “content is structured to help teachers learn and apply AI literacy skills to their pedagogy, based on understanding AI concepts, real-life case studies, hands-on activities, and sharing with fellow teachers” (p. 3).

Instructional designs suggested for teachers were distinct as well. American documents covered general benefits and risk mitigation of AI around the instructional part of teaching itself,

from curriculum and assessment design, improving and personalizing student feedback, and administrative work as a teacher. Going further, Korean materials provided a specific framework and model to follow to use AI in the classroom; AI convergence and Science, Technology, Engineering, Arts, and Mathematics (STEAM) education.

This approach is not merely about applying AI tools but also incorporating aspects of AI—such as computational thinking, algorithm mechanisms, and problem-solving—into various subject areas. With that, Kang et al. (2021) focused on introducing strategies and cases of AI convergence education, highlighting the interdisciplinarity between AI and different subjects. With the clearer vision of converging AI into each subject field, South Korean sources focused on having teachers experience different tools firsthand as a new learner of AI. This is a crucial approach as Ellsworth (1989) argued for critical pedagogy that redefines teachers as a learner, who *re-learns* by learning with students. South Korean teacher education about technology has been emphasizing reflection on their past teaching experience to think about how they can tailor it for their classrooms (Ahn, 2007, p. 145). Kim (2004) also addressed the community of teachers as crucial to support each other and relieve hesitance, especially from veteran teachers, who are not used to utilizing digital devices or trying unfamiliar teaching strategies.

Discussion

Looking at characteristics of AI teacher education from the US and South Korea, the education system is the primary factor that affects the structure. In the US, which is much less centralized, generic guidelines on AI use exist and they do clearly mention potential benefits and risks, yet it is ultimately up to district and schools to determine how to support teachers and draft guidelines and implement AI use for their students. In South Korea with its very centralized system, contents are very organized and there are very clear directions on how to use AI in

diverse circumstances. By combining these approaches, the US could learn from South Korea's consistency on guidelines for different shareholders to be on the same page on AI adaptation. As much as empowerment is important, recent news has pointed out how teachers are confused with AI regulation and its effective use without certain guidelines and starting point to learn more about it (Langreo, 2025). Meanwhile, South Korea could work on adding more flexibility from the US, allowing more room for teachers to customize AI literacy skills and tools.

Beyond the analysis of similarities and differences, I noticed that both countries lack thorough onboarding on significance of AI and use of AI specifically as a teacher. Guidelines on ethical and responsible use of AI and different aspects around it—trust, mechanism, bias, etc.—are something that anyone can relate to. Although it clearly specifies AI's progress and social change around it as a importance of AI education for both teachers and students, they do not prompt teachers to reflect personally on what AI means to them and how they will apply the skill in their own contexts, which would lead to essential and deeper shift and innovation of their pedagogy (Camburn, 2015). Recognizing factors around teachers' perceptions of AI and their pedagogy elaborating AI literacy framework and support that is specific to teachers context would be crucial.

This work is meaningful as it analyzes AI education for teachers at different levels. It elaborates how sociopolitical settings and factors (macro) affect the goals and contents of the teacher AI education, the technology and shareholders involved in it (meso), and how teachers are narrated and instructional methods used in these programs and guidelines (micro). This is helpful to see aspects of teacher AI education more holistically. The distinct education systems underscore how teachers are encountering and getting trained with AI similarly at a macro level but also how these experiences vary due to sociopolitical settings and the organization of

schools. Likewise, this study helps fill the gap in comparing AI education for teachers in different countries. As AI is ubiquitous globally and many AI tools are being developed in collaboration with different countries, recognizing these factors and conducting further comparative research to explore connections and differences will be vital.

Recommendations

The biggest challenge during the process was the limited access to materials. I was only able to gather American AI education and guidelines rather than actual training programs as they required a subscription and payment. Although many sources available were published by MOE in South Korea, it was hard to log into some private teacher education institutional platforms to see which tools teachers are using as I do not have teacher credentials.

Moving forward, based on this analysis of AI teacher education documents, future research could investigate whether teachers are able to effectively use or apply the information presented in these documents, as well as which aspects of the materials are more relevant to their classroom. Research should inquire the perceptions and attitudes that teachers' and learners have towards AI, and their relationship with the behavior and development of AI Literacy skills (Rütli-Joy et al., 2023). How do they find and access these trainings for AI in education? Do they go through the training from personal interest or to fulfill a requirement of fulfilling the professional development credit? (which Korean teachers must do) After completing the program, do they feel more confident in using AI and shifting their opinions on AI in education? Specifically given the rapid development of AI and the changing environment around technologies, answering these questions and aligning them with the stated goals in the materials would be beneficial for policymakers and educational stakeholders in designing more effective and practical contents for teachers.

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