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Journal of Social Studies Education Research
Sosyal Bilgiler Eğitimi Araştırmaları Dergisi

2024:15 (4), 163-196

Role of Artificial Intelligence in Enhancing Learning Outcomes of Pre-Service Social Studies Teachers

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Abstract

As the use of artificial intelligence (AI) in academic fields increases, it has become necessary to evaluate its effectiveness before integrating it extensively into the training of school teachers. While AI is known to improve pre-service teachers' classroom management skills, its role in improving their learning outcomes is understudied. This descriptive study aimed to examine whether the use of artificial intelligence (AI) improves the learning outcomes of pre-service social studies teachers in Kuwait. A questionnaire survey was conducted among a randomly selected sample of 100 female teachers at Kuwait University's College of Education. The data were analyzed using SPSS software and simple linear regression analysis to derive Pearson's correlation coefficient, Cronbach's alpha, means, frequencies, percentages, and standard deviations. The results revealed that using AI applications significantly enhanced the participants' learning outcomes, indicating AI's potential to transform educator training. Pre-service teachers demonstrated a strong grasp of AI's value in education and proficiency in integrating AI into their lessons. They effectively utilized Intelligent Tutoring Systems (ITS) and Smart Content, highlighting their ability to leverage advanced AI tools to enhance teaching strategies and student engagement. This study highlights the critical role of AI in contemporary education, contributes to the theoretical literature, and paves the way for further research. Moreover, it holds practical significance as the findings can be used to extensively adopt AI-supported learning in teacher preparation courses to align teaching methods with modern educational trends.

***Keywords*:** *Artificial Intelligence applications, learning outcomes, social studies, pre-service Teachers*

Introduction

One of the most significant technologies that is transforming society today is artificial intelligence (AI). AI uses algorithms and data to simulate human intelligence, enabling the creation of computer programs capable of intelligent behavior (Borana, 2016). It could be considered an

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extension of home computers with the addition of programs that help perform many tasks automatically (Gocen & Aydemir, 2021). AI also includes intelligent devices and self-learning algorithms that simulate human mental capabilities such as learning, reasoning, perception, problem-solving, planning, and decision-making (Frankenfield, 2023). AI is known to outperform humans in various tasks, particularly in terms of knowledge discovery. For example, AI-driven educational platforms can analyze student performance data to identify learning gaps and recommend personalized learning pathways, thereby enhancing the effectiveness of pre-service teacher training programs (Chauke et al., 2024; Igbokwe, 2023).

AI has penetrated many aspects of human life through various applications, with robots and neural networks being among the most significant. (Mabungela, 2023; Pujari et al., 2021). To align with rapid advancements in this domain, computer applications have transitioned into intelligent systems, particularly in the realm of education. Educational systems have had to adapt their activities and programs to benefit from this technological revolution. Thus, AI applications have become widely used in education using asynchronous (e.g., email and platforms) and synchronous (e.g., online chat rooms, audio channels, and video conferencing) technologies. AI in education has proven to be beneficial due to the application of intelligent techniques for monitoring, process management, and optimization, as well as tutoring, communication, analysis, assessment, and learner evaluation. AI can be used in education to better meet the needs of each individual student, organize content, and create efficient teaching and assessment techniques (Baber, 2020; Baytak, 2024; Makeleni et al., 2023).

AI helps improve learning outcomes and education quality (Amreya & Ismail, 2021; Igbokwe, 2023; Ogurlu & Mossholder, 2023). AI can also enhance students' knowledge acquisition, improve their problem-solving skills in natural environments, and facilitate collaborative work.

AI provides access to and improves communication between teachers and students (Ahmad et al., 2021), improving learner satisfaction and learning outcomes. AI positively affects learning outcomes by creating intelligent environments using innovative technologies. Tsai et al. (2021), Huang et al. (2023), and Weng and Chiu (2023) all point to the favorable effects of AI on learning outcomes in a classroom setting.

AI technologies can transform both teaching and learning methods (Ahmad et al., 2021) by facilitating the use of intelligent teaching methods to provide customized learning services. With AI, teachers have better access to high-quality educational resources and materials that are

specifically designed for them. Additionally, AI can help them identify their own knowledge gaps and provide them feedback on areas requiring improvement (Jamal, 2023). AI applications enhance teachers' performance, provide support, and increase collaboration.

Extensive use of AI applications would lead to greater prospects for school reform and scientific advancement (Mahmoud, 2020). In addition, AI applications are revolutionizing the conventional problem-solving paradigm and providing workable answers to some of the most difficult problems in social studies education when combined with other cutting-edge technologies such as Big Data and cloud computing. AI has been incorporated into social science education, bringing historical events and geographical knowledge into the classroom. For example, Intelligent Computer-Assisted Instruction (ICAI) is used to teach the geography of South America, including details about industries, exports, demographics, and capital cities. This method stimulates classroom discussions and knowledge-seeking, as teachers pose questions and students use computers to find answers, which are then evaluated for accuracy by the teacher. This process makes learning more accessible to students (Jones, 1985). By exploring the social sciences through the lens of AI, we can break down existing barriers to knowledge, achieve greater coherence, gain deeper insights into human behavior, and work towards resolving complex social issues (Pavaloiu et al., 2017).

AI applications play a crucial role in improving learning outcomes. Learning outcomes sum up the cognitive knowledge and performance skills that pre-service teachers should acquire. Educational institutions must articulate these outcomes to clarify the goals they strive to achieve and the skills they aim to impart. Institutions should design outcomes based on societal requirements and aim for excellence to ensure high-quality education (El-Gazzar et al., 2019). Improving learning outcomes involves imparting self-directed learning skills and promoting active collaboration while considering cognitive outcomes. It also involves developing the ability for self-assessment and performance improvement to achieve the desired goals and ensure high quality of education (Al-Azmi, 2022; Khalaf & Alshammari, 2023).

Teachers guide the learning process by preparing educational and curricular plans, organizing and implementing students' learning processes, and contributing to the success of the educational process (Murati, 2015). In Kuwait, there is a need to focus on pre-service teacher preparation and cover all academic and educational teaching specializations. Pre-service teachers are university students who aspire to become competent teachers (Al-Shammari & Al-Ajmi, 2017). They enroll in teacher preparation programs which are designed based on academic requirements (Al-

Shammari & Al-Ajmi, 2017). Most pre-service teachers have mixed feelings about AI (Haseski, 2019), and AI has benefits and risks for them. However, Kaplan-Rakowski et al. (2023) found that pre-service teachers believed Generative AI (GAI) could enhance their professional development. AI can be viewed as a robot that operates through self-thinking and learning systems to make independent decisions based on the situation. Pre-service teachers have benefited from AI applications in learning practices, where chatbots have been used for language learning to facilitate dialogue and develop student evaluation processes (Yang, 2022). This has resulted in a desire to acquire educational abilities and competencies in the use of AI applications to attain educational goals (Haseski, 2019).

Challenges resulting from contemporary scientific and technological changes have emphasized the importance of improving the learning outcomes of pre-service teachers in Kuwait. However, despite the important role of teachers and current trends in developing and updating education systems in an integrated and comprehensive manner, certain drawbacks have made the preparation of pre-service teachers less efficient (Al-Shammari, 2014). The lack of sufficient modern educational resources and instructors' complacency regarding the problems pre-service teachers face are some of the issues associated with the practical education period (Al-Dhahim, 2018). Since teacher preparation systems in Kuwait are new, limited, and in need of more diversity and expansion to provide real support for teachers (Al-Harbi & Musail, 2021), merely joining the profession is not enough; supportive systems must be in place to maintain excellence. Despite the efforts made by the Ministry of Education to enable social studies teachers to acquire the necessary competencies to keep up with technological advancements, they still lack technical competency (Al-Azmi, 2020).

The use of AI and virtual reality has been found to be effective in improving pre-service teachers' classroom management skills (Attwood et al., 2020). However, to the best of our knowledge, few studies have investigated the role of AI applications in improving the learning outcomes of pre-service teachers.

In terms of the research context, this study extends the existing literature by highlighting AI as one of the most important modern tools in education. In an era characterized by rapid technological advancement, understanding the extent of AI utilization in social studies instruction is critical. As traditional teaching methods evolve, it is imperative to discern the prevalence of AI tools and

strategies in classrooms to provide educators, administrators, and policymakers with invaluable insights into contemporary educational landscapes.

Moreover, a comprehensive assessment of AI's presence in social studies teaching will shed light on potential trends and growth areas, thereby fostering informed decision-making for curriculum development and instructional enhancement. Uncovering the benefits of employing AI in teaching social studies will facilitate a nuanced understanding of its potential to enrich the learning experience. Such insights can guide educators in effectively harnessing AI tools to augment teaching methodologies, personalize learning experiences, and cultivate students' critical thinking skills through innovative approaches.

In accordance with the research contributions, the significance of this study lies in the domains of teacher preparation and professional development, particularly in delineating the learning outcomes of pre-service social studies teachers. The findings will inform higher education institutions and teacher training programs about the AI-related competencies and skills that future educators should possess, ensuring they are adept at integrating AI into their pedagogical practices and aligning teacher preparation with the evolving needs of modern classrooms.

Additionally, this study offers an in-depth understanding of the current landscape of AI integration in social studies teaching, explores AI's potential contributions to pedagogical practices, and informs the definition of learning outcomes for preservice social studies teachers. The findings may stimulate comprehensive research, enrich the theoretical literature on the topic in the context of Kuwait, and contribute to the development of learning outcomes that align with modern trends of AI use in education.

Regarding originality, to the best of the researcher's knowledge, this is the first study that focuses on the intersection of AI integration and teacher preparation in the context of pre-service social studies education at Kuwait University. This study addresses a critical and contemporary aspect of educator training by recognizing the specific AI-related competencies and skills that future educators need. It provides valuable insights to higher education institutions and teacher training programs, guiding them to equip future teachers with the skills necessary to effectively integrate AI into their pedagogical practices.

This comprehensive exploration of AI's potential contributions to social studies teaching fills a gap in the theoretical literature and sets the stage for further in-depth studies. This contribution is particularly significant for the educational landscape in Kuwait, as the nation aims to develop

learning outcomes that incorporate modern AI applications, thereby enhancing the quality and effectiveness of teacher education in tune with global trends.

Research Objectives

This study seeks to determine the role of AI applications in improving the learning outcomes of pre-service social studies teachers. The study focuses on AI use in the College of Education at Kuwait University and poses the following research questions.

1. What is the extent to which AI applications are used by pre-service social studies teachers in their learning process?
2. What is the level of learning outcomes exhibited by pre-service social studies teachers?
3. What impact does the integration of AI have on the learning outcomes of pre-service social studies teachers?

Theoretical Framework

Theory of development of teacher expertise

David Charles Berliner originally proposed the theory of teacher expertise between 2001 and 2004 (Berliner & Gage, 2001). The theory defines teachers' cognitive capabilities as the most prominent progressive catalyst in the professional development process, in the sense that enhancing teachers' cognition helps elevate their instructional expertise. Moreover, the theory addresses teachers' ability to process all types of information they are exposed to in professional development programs to enhance their teaching and classroom management skills (Van der Lans et al., 2018). Consequently, each stage is characterized by unique cognitive and behavioral attributes that mark the teacher's journey from beginner to highly skilled educator. This model not only highlights the cognitive shifts that occur as teachers gain experience but also emphasizes how these shifts translate into observable changes in teaching behavior. Furthermore, Berliner's Theory of Development in teacher expertise demonstrates the specified stages that determine teachers' levels of cognition, expertise, and instructional skills, given that each stage must be improved before transitioning to the next phase. These stages are outlined in detail as follows (Van der Lans et al., 2017):

1. Novice: Limited knowledge and reliance on rules, with scripted teaching and less responsiveness to student needs.
2. Advanced Beginner: Recognition of situational aspects, increased flexibility, and responsiveness to classroom dynamics.
3. Competent: Effective decision-making, balanced use of rules and situational understanding, and improved classroom management.
4. Proficient: Intuitive grasp of classroom situations, proactive issue anticipation, and fluid adaptation of teaching strategies.
5. Expert: Deep, tacit knowledge, instinctive decision-making, exceptional classroom management, and impactful, creative teaching practices.

The three-level theory (micro, meso, macro) of AI-based learning theory

Gibson et al. proposed this theory in 2023 and provided a comprehensive framework for understanding and enhancing educational processes at multiple levels. The theory focuses on individual learners at the micro-level and proposes a model that progresses through four stages with four linking dynamics. Internal and external factors influence this process, with internal factors forming submodels that optimize the use of energy and information in learning (Gibson et al., 2023).

This individualized approach allows AI to personalize learning experiences for each student as per their learning pace and needs. By addressing these micro-level dynamics, AI can help unify various learning theories and create a more cohesive understanding of how individuals learn. At the meso level, the theory focuses on the social environment of learning teams, emphasizing collaborative problem-solving and creative activities. Internal factors, such as group dynamics and interpersonal relationships, play crucial roles in forming sub-models that harness collective energy and information (Gibson et al., 2023).

External factors, when present, link back to either the micro or macro level, ensuring a holistic, contextual understanding. AI systems can facilitate and enhance team-based learning by optimizing team members' communication, coordination, and resource sharing. This level underscores the importance of social interactions in learning, with AI playing a pivotal role in supporting and enhancing these interactions. The macro level broadens the scope to an

interdisciplinary, cross-cultural space where groups interact to build knowledge and develop future skills (Gibson et al., 2023).

This level highlights the importance of large-scale collaboration and knowledge exchange across different cultures and disciplines. At this level, AI facilitates interactions, promotes large-scale educational initiatives, and supports interdisciplinary research and learning. Therefore, by integrating the micro, meso, and macro levels, the theory offers a unified structure that is cognizant of AI's computational capabilities and possibilities. This comprehensive approach helps organize and advance a wide range of learning theories, providing a robust framework for understanding and enhancing learning at all levels (Gibson et al., 2023).

The current theoretical framework

The current study's theoretical framework is derived by merging the theory of development in teacher expertise with the micro-macro-meso AI-based learning theory. The assumptions of this framework can be outlined as follows.

1. *Continuous Learning and Development:* Learning and expertise develop progressively through defined stages, highlighting the necessity for systematic advancement to achieve higher levels of proficiency and expertise.
2. *Impactful Advancements:* Internal and external factors significantly influence the learning process, suggesting that a holistic understanding of these factors is essential for effective development and learning outcomes.
3. *Personalized Learning:* Integrating new knowledge and skills with personalized learning experiences is necessary. AI can facilitate this by tailoring educational content to individual needs and by enhancing collaborative learning environments, thereby creating a more cohesive and effective learning process at all levels.

The role of this theoretical framework in elucidating and confirming the study findings will be discussed in the Conclusion.

Literature Review

Artificial Intelligence

Artificial intelligence describes a machine's capacity to carry out tasks that often call for human intelligence. Furthermore, this concept is actually extremely comparable to many top AI researchers' definitions as well as those found in top AI textbooks. Earliest of all, this term should be understood to be incredibly broad, encompassing not only the advances of the last several years but also the accomplishments of the earliest electronic computers, which date back to the 1940s. The term "Artificial Intelligence" has a dynamic definition. People are quick to refer to anything that is novel and fascinating as "artificial intelligence." After a specific AI approach's capability, however, they are frequently referred to as just software (Allen, 2020).

In addition, Artificial Intelligence (AI) describes systems that exhibit intelligent behavior by analyzing their surroundings and acting somewhat independently to accomplish predetermined objectives; base systems can be integrated into hardware devices (such as sophisticated robotics, driverless vehicles, drones, or Internet of things applications). On the other hand, those systems can be entirely software-based and operate in the virtual world (such as voice assistants, image analysis, software, search engines, speech, and facial recognition systems) (Azzali, 2020).

In addition to the two distinct software programming objectives, the distinction also conceals a different understanding of the role of the user of the software systems: in the first, the human is a machine replaceable subject in a system and only exists for comparison; in the second, the human is a user that the machine can enhance. An intelligent machine can be a computer that can mimic the capabilities of the human brain (AI) and, at the same time, support the functionality of our brain (IA). Using servant and maestro metaphors, AI can be considered as a servant that substitutes human beings in complicated activities (elaborate calculations, complicated mechanical activities) (Barile et al., 2019).

Teachers can use AI broadly in their classes in order to gain more benefits from AI applications. These technologies are the AI technologies that help the teacher teach. In this example, AI works as a complementary tool to the teacher, providing various features such as boosting time spent on teaching by outsourcing repetitive tasks or broadening the approaches a teacher may use to teach more freely. Examples could be the use of AI-enabled new teaching techniques or automatic grading. Here are a few sample methods: automated essay scorers using AI methods score Essays. Teachers do this by using natural language processing and machine learning to score essays

without the need for human interaction. Artificial intelligence models identify patterns in previously human-scored essays to identify better-quality essays.
The Teacher Dashboard of Inq-Blotter is AI technology that can identify when a student is having difficulty with a concept or problem and notify the teacher so they can help. With the use of this technology, teachers may more successfully identify and instruct problematic students, ensuring that no kid falls behind and the class as a whole advance (Nguyen, 2023; Vargas et al., 2024).

Previous Studies related to AI in the educational context regarding pre-service social studies teachers

The study of Shifflet and Hunt (2019) aimed to explore how integrating literacy and social studies curricula is an effective strategy to encourage civic-minded social studies instruction in elementary schools. The study relied on a qualitative method that utilized interviews as a study instrument. Moreover, the study sample comprised 14 teachers. In addition, the results revealed a clear understanding of the challenges of integration and the significance of deliberate preparation necessary for successful integration. Moreover, teacher candidates required exceptional integration modeling throughout their clinical placement in order to overcome the limitations of typical segmented scheduling. The interns discussed the value of curricular integration and stated that they wanted to combine literacy and social studies. They stated numerous obstacles that they believed hindered or prevented them from integrating properly, and they acknowledged that despite their integration aspirations, they were not regularly able to accomplish desirable integration.

Kartal's (2020) study aims to perform a meta-synthesis of social studies instruction in elementary schools. This review of meta-synthesis interprets and assesses qualitative data, examines the findings of the relevant studies, and highlights parallels and divergences. Data collecting began on October 10, 2017, and it lasted until June 30, 2018, when the article was finished. Moreover, the findings indicated that research primarily focuses on curriculum assessment, subject/unit analysis, and values education. Studies that evaluate curricula focus mostly on social studies programs for grades one through five; they rarely include topics such as children's literature, critical thinking standards, families, democracy, and social studies in basic education. The majority of qualitative research on social studies instruction in primary schools was action, case study, or phenomenological research; in contrast, there are very few studies based on grounded theory or ethnography that address the same subject.

Furthermore, either the majority of those studies did not indicate the analysis methods they utilized, or they used descriptive and content analysis. The findings implied that the program's application in social studies instruction in primary schools should be the focus of efforts. As a result, research on social studies in primary schools generally focuses on curriculum evaluation and does not address how curricula are implemented.

The study of Yetişensoy (2024), is where the current study comes into play, as it aims to determine how potential social studies professors feel about artificial intelligence. The study sample comprised 342 prospective social studies teachers. The research adopted the mixed approach that utilized the attitude scale towards AI, which was created by Schepman and Rodway and modified by Kaya et al. for Turkish culture. The results showed that the variable of perceived AI expertise explained differences in the attitudes of aspiring instructors toward AI. As a result, individuals who reported having a high level of AI expertise demonstrated noticeably more positive attitudes than those with an average or low level of understanding. The study also found that male prospective teachers had much greater positive sentiments and significantly lower negative attitudes than female prospective instructors. The findings showed no discernible difference between the positive and negative attitudes based on grade level or daily internet usage. The qualitative results also showed a serious dearth of knowledge about the nature and application of artificial intelligence. The study found that many artificial intelligence concepts held by aspiring teachers lacked theoretical foundation. A lot of them made note of the possibility that AI might pose a serious threat in the future. They were worried but could not pinpoint a particular cause for these possible dangers. Furthermore, most aspiring educators could not give any instances of AI technology other than chat programs like ChatGPT and Siri.

Learning Outcomes

The desired outcomes from students that lead to final displays are known as learning outcomes. The phrase refers to these outcomes and their demonstrations, which take place during or following a substantial learning experience. Accordingly, an outcome is a demonstration of what students are capable of doing after they have had and finished all of their prior learning experiences rather than a compilation or average of those experiences. Additionally, this means that rather than being obvious displays of learning, outcomes are more like internal mental processes than the things that students think, feel, remember, know, or comprehend. Rather, outcomes are the practical applications of students' knowledge and comprehension (Baghdadi, 2021).

Furthermore, learning outcomes are quantifiable declarations of what students should know, be able to do, and possess after successfully completing a particular learning experience. They serve as an articulated statement of the educational goals. Moreover, learning outcomes have emerged as a crucial idea in modern education, defined as what the student should know, comprehend, and be able to perform as a result of the learning process. Additionally, the term has been coined to provide more accuracy in learning outcomes because they are always predefined in terms of what is expected at the ultimate end of the learning process (Kowalska et al., 2022).

For further elaboration, (Yao et al., 2024) showed that learning outcomes have various indicators, such as:

1- The prevalence of students' attendance in their classes reflects their commitment.
2- Group discussions are one of the most important indicators for learning outcomes.
3- The proposed issues are considered essential predictors of learning outcomes.
4- If students make many comments, this indicates positive learning outcomes in the class.
5- The student understands their course materials and applies them successfully.

AI played a crucial role in enhancing students' learning outcomes. Consequently, Alam (2023) highlighted that virtual and augmented reality (VR/AR) is used to create immersive learning experiences that let students explore and interact with virtual environments and simulations, AI is used to personalize learning experiences for students, adapt to their unique needs and abilities, and provide real-time feedback on their progress. Online learning systems give students more freedom regarding when and where they can learn and global access to educational materials and courses. One type of technology-enabled learning that adapts to a student's learning style, pace, and progress is called adaptive learning. This is accomplished with algorithms that analyze student data, including exam results, and modify the curriculum or pedagogy as necessary. Gamification is also heavily emphasized in the context of teaching and learning. Students find learning to be more dynamic and engaging when it includes game-like components. The field of formal education has fundamentally revolutionized thanks to AI.

In addition, robotics and AI are becoming increasingly common in current society. It has been demonstrated during the past ten years that the rapid advancement of AI technology can alter and enhance educational experiences. Simultaneously, the subject of robotics keeps expanding and offers virtual as well as actual experiences. The creation of an integrated analytical framework makes it possible to analyze learning outcomes for students in a more comprehensive, inclusive,

and balanced manner by taking into account a wider range of human potential. This, in turn, uses robots and AI to enhance student learning. Moreover, AI shows that learners' individual trajectories have varying paths and speeds, which is a reflection of the influence of using AI and robots on learning designs (Salas-Pilco, 2020).

Previous studies related to learning outcomes

The study of Dharma and Lestari (2022) aimed to evaluate how the problem-based learning approach affects students' critical thinking abilities and learning outcomes. The study relied on a quantitative quasi-experimental study that used a posttest-only control group design. Students in the fifth grade of primary schools made up the study's population. The sample was selected by random sampling, consisting of 68 pupils from two distinct schools. The results showed that problem-based learning positively impacts students' critical thinking abilities and learning outcomes in social studies. Thus, it can be said that problem-based learning significantly enhances social studies. Learning objectives and students' capacity for critical thought in comparison to the use of traditional learning approaches. This study implies that in order to enhance students' comprehension of the material more quickly and readily during the learning process, teachers should be able to include the problem-based learning model in the curriculum.

The study of Bektas (2021) aimed to examine the pre-service teachers' activities in developing thinking skills and professional abilities. The study sample comprised 31 pre-service teachers (16 women and 15 men). The study relied on a qualitative method, utilizing interviews as a study instrument. The results showed that the skills dimensions include skills such as questioning, problem-solving, scientific, analytical, thoughtful, empathetic, objective, and artistic thinking were developed. Other skills included critical thinking, thinking from multiple perspectives, original thinking, reflective thinking, high-level thinking, and problem-solving. On the other hand, values like justice, empathy, patriotism, austerity, respect, trust, self-assurance, solidarity, diligence, and responsibility were created within the value dimension. The pre-service enhanced their professional competencies in lesson planning, implementation, activity development, material use, and pedagogical features, according to an evaluation of the overall outcomes. Updates to curricula should be made to teacher training programs offered by institutional and educational programs to guarantee that pre-service teachers' professional needs and competencies are satisfied and supported.

The study of Gürgil et al. (2019) aimed to examine the views of aspiring educators regarding WebQuest applications by acquainting them with the teaching resources and gathering their insights from the WebQuest design process. The third-year undergraduates at a state institution in Ankara studied social studies education, and a sample included 22 students. Moreover, the study employed a qualitative method by utilizing a peer evaluation form and an interview form as distinct data-gathering instruments. Furthermore, data was analyzed using content analysis. Social studies Preservice teachers believe it is beneficial for teachers to supervise WebQuest teaching activities. Preservice instructors identified the WebQuest teaching activities' specific principles as a poor factor. Preservice teachers also underlined how challenging it is to use WebQuest teaching activities in places without computer or Internet access. Even though nearly 50% of the participants said they intended to use WebQuest teaching activities in their classes when they first began their careers as educators, they also shared their concerns.

Previous Studies related to the relationship between AI and learning outcomes in the educational context

The study of Maqbool et al. (2017) aimed to explore how AI applications can enhance student learning outcomes. This study relied upon the documentary method by reviewing the literature and analyzing reports. Moreover, the results showed that AI is revolutionizing the educational landscape by providing creative ways to improve student experiences. The impact of AI on learning outcomes, teaching approaches, and the entire educational environment are the main topics of this paper, which offers a thorough overview of how AI is transforming education. Personalized learning experiences catered to the needs of each individual student have been made possible by the use of AI in education. Adaptive learning systems driven by artificial intelligence examine student performance data to design personalized learning pathways that meet each student's knowledge and pace. AI is also changing the way that education is delivered by giving teachers new tools to improve instructional tactics and expedite administrative duties. AI is also transforming assessment beyond standard tests to more insightful and dynamic evaluation techniques. Real-time analysis of student replies using AI-powered assessment instruments can provide quick feedback and understanding of students' understanding and development. AI is being used in education for administrative tasks, including scheduling, student enrolling, and resource distribution. AI-powered solutions can streamline these procedures, resulting in more effective and efficient administration of educational establishments. Even with all of AI's

advantages for education, issues such as worries about algorithmic bias, data privacy, and the need for teacher preparation remain to be resolved. In order to fully realize the potential of AI in education and guarantee that everyone has fair access to high-quality education, it will be imperative to address these issues.

The study of Tsai et al. (2021) aimed to identify the impact of AIOT implementation courses on the learning outcomes of senior high school students. The study sample includes 36 Senior One students from a Kaohsiung senior high school who were chosen as research participants for a 13-week period of two classes each. Furthermore, the researchers adopted a survey approach that utilized a questionnaire, TAM, and interviews as study instruments. In addition, the results showed that "self-efficacy" significantly improved users' perceptions of usefulness and simplicity of use. There was no significant correlation between "learning anxiety" and "perceived ease of use" or "perceived usefulness" of flipped learning through online E-Learning. Both "perceived ease of use" and "perceived Usefulness" positively predicted "behavioral intention" in flipped teaching with online digital assets. The "perceived ease of use" positively affected "perceived usefulness". "Learning engagement" significantly affected students' "behavioral intention" to learn. Students were eager to discover new information about science and technology.

The study of Alotaibi and Alshehri (2023) aimed to examine the benefits and drawbacks of Saudi Arabia's higher education institutions implementing AI-based learning outcomes. Additionally, the study examined Saudi Arabia's top universities' role in developing AI-based learning outcomes. The study relied on documentary methods that utilized Scopus and Web of Science databases; pertinent literature was gathered, leading to the selection of fifty-five papers for further study. The results showed that while AI is still in its infancy as a learning tool, higher education institutions now have to deal with it. Acquiring the technical skills required to engage with and build artificial intelligence in the future is critical, and embracing this transformative technology is essential for solving future learning difficulties. In addition, results showed that AI has the ability to revolutionize teaching and learning approaches, solve important educational difficulties, and hasten the advancement of Saudi 2030 targets. Nevertheless, the study also draws attention to some difficulties in implementing AI-based learning in Saudi Arabia's higher education system, highlighting the necessity for educators to pick up new technology skills to use AI pedagogically.

Methodology

The following section addresses and demonstrates the methodological procedures used in the current study to achieve the research objectives. Such procedures include identifying the methodology, population, sample, and instrument to verify its psychometric specifications through the verification of the instrument's validity and reliability. The methodology also demonstrates the statistical analysis that helps analyze the findings.

Research design

Descriptive analysis was used as the main methodology because it involves identifying, describing, comparing, and clarifying all collected data. Standard deviation, frequency distribution, percentage distribution, and measures of central tendencies were used to present the information gathered from the questionnaires. The standard deviation and frequency distribution illustrate the number of observations (Lim et al., 2022). Therefore, this methodology is considered apt to fulfill the study objective and find answers to the research questions.

Participants

The study sample comprised 100 pre-service social studies teachers at the College of Education, Kuwait University. All participants were female due to the original population having very few if there were any, males. Female students predominantly occupy this major, so the participants were also female.

Table 1

Distribution of Participants According to their Demographic Characteristics

Demographic Information		Frequencies	Percentages
Sex	Male	0	0.0%
	Female	100	100%
		100	100%
Academic year	First-year	29	29%
	Second-year	42	42%
	Third-year	14	14%
	Fourth-year	15	15%
		100	100%
Educational level	Elementary School	90	90%
	Middle and High School	10	10%
		100	100%
Previous courses	None	87	87.0%
	Less than 3 courses	10	10.0%
	From 3 to 5 courses	3	3.0%
	More than 5 courses	0	0.0%
TOTAL	100		%100

Table 1 shows participant profiles according to their demographic classification, including year level and educational background. Most participants are in their second year, while most graduated from elementary school with no previous course taken.

Data Collection Tools and Validity/Reliability-Verification Process

The current research uses the questionnaire as the main research instrument, helping identify the role of artificial intelligence in enhancing learning outcomes for pre-service social studies teachers. Upon designing the questionnaire, the research instrument was sent to a number of experts and academic personnel who have considerable experience in the educational and technological domains; in order to authenticate the linguistic viability of the questionnaire, the extent to which it is considered clarified, and the level to which each item reflects the overall research scope and instrument approach. Accordingly, eighty-three percent (83%) of the experts approved the linguistic characteristics of the questionnaire and deemed it viable for usage; they also authenticated and approved the items' relevance. Therefore, the questionnaire was designed in its finalized form, including forty-two (42) items distributed over two main sections. The sample includes thirty (30) participants aside from the main sample in order to further verify the viability of the psychometric specifications of the instrument. Furthermore, the 5-point Likert scale was used to gauge the questionnaire, given that each point was assigned a specific degree. For instance, a degree of (1) is assigned to "strongly disagree", a degree of (2) is assigned to "disagree", a degree of (3) is assigned to "somewhat agree", a degree of (4) is assigned to "agree", whereas a degree of (5) is assigned to "strongly agree".

Overall viability was confirmed by verifying the questionnaire's construct validity and gathering sufficient evidence to confirm a positive level of relevance and correlation between the overall viability degree for the entire questionnaire and its items. These levels resided between (986**) and (991**), indicating sufficient reliability. The questionnaire was distributed online to the study participants.

Table 2

Reliability Coefficients and Total Score of the Questionnaire Items

Subscale	No.	Alpha
AI applications	21	.992
Learning Outcomes	21	.979
Total score	42	.964

The Cronbach's alpha values for the items ranged from 0.979 to 992. The overall reliability coefficient of the questionnaire was 0.964.

The data were analyzed, and the findings were extracted using the statistical procedures of means and standard deviations, frequencies and percentages, Cronbach's alpha, Pearson's correlation coefficient, and simple linear regression analysis using Statistical Package of Social Science SPSS software version 22.

Data Collection

To achieve the study's objectives, the researcher relied on primary and secondary data sources. Primary data are collected directly from participants in the fieldwork, often through face-to-face interviews or discussions with community members. However, they can also be collected through phone interviews, wireless communication, email exchanges, and direct observation. Given the quantitative nature of the current study, the primary data collection tool is the questionnaire. Secondary data, on the other hand, are information usually gathered by non-participating researchers through published research, internet materials, reports, and academic research in both Arabic and English to enrich the theoretical aspect of the study.

Data Analysis and Techniques Used in The Analysis

The data analysis process is defined as a set of steps that include examining, categorizing, tabulating, testing, or recombining qualitative and quantitative evidence to address the study's initial propositions (Yazan & De Vasconcelos, 2016). Before conducting any analysis and hypothesis testing, three essential steps must be taken: data coding, hypothesis processing, and testing the reliability and validity of the scales used in the study.

Data coding involves assigning codes to responses based on the statements in the questionnaire. For example, the gender variable may be coded as 1 for male and 2 for female. Additionally, several hypotheses and processing tasks need to be performed before analysis, such as dealing with missing data, linearity, normal distribution, homoscedasticity, and multicollinearity (Hair et al., 2010).

Statistical methods

Based on the objectives and the nature of the current study, the collected data were analyzed using the SPSS software program, along with the following methods that assisted the researcher in extracting the research findings.

*Frequencies and Percentages***:** To identify the characteristics of the study sample according to their demographic data.

*Arithmetic Means and Standard Deviations***:** Calculate the means of the study's research variables according to participants' responses.

*Pearson Correlation Coefficient***:** To calculate the questionnaire's construct validity.

Linear Regression Analysis Test, *Range Equation:* To describe each of the research variables as follows:

1. If a response reaches the degree of (5), the degree is deemed (Very High).
2. If a response reached a degree (4), the degree was deemed (High).
3. If a response reaches degree (3), the degree is deemed (moderate).
4. If a response reached a degree (2), then the degree was deemed (Low).
5. If a response reaches a degree of (1), then the degree is deemed (Very Low).

Where:

1. 1 to less than 1.80 (Very Low).
2. 1.80 to less than 2.60 (Low).
3. 2.60 to less than 3.40 (Moderate).
4. 3.40 to less than 4.20 (High).
5. 4.20 to less than 5 (Very High).

Findings

This section presents the results corresponding to each research question.

What is the extent to which AI applications are used by pre-service social studies teachers in their learning process?

Table 3 shows that the overall mean score of the first axis (M=4.14; SD=.406) was “high,” suggesting the participants' efficiency and effectiveness in using and employing AI applications and understanding the importance of AI technology in education.

Table 3

Means and Standard Deviations of Participants' Responses Regarding AI Intelligence Applications

Subscales	M	SD	Rank	Degree
Intelligent tutoring systems	4.23	.389	1	Very high
Smart content	4.22	.491	2	Very high
Chatbots	3.96	.616	3	High
Overall mean	4.14	.406	High	

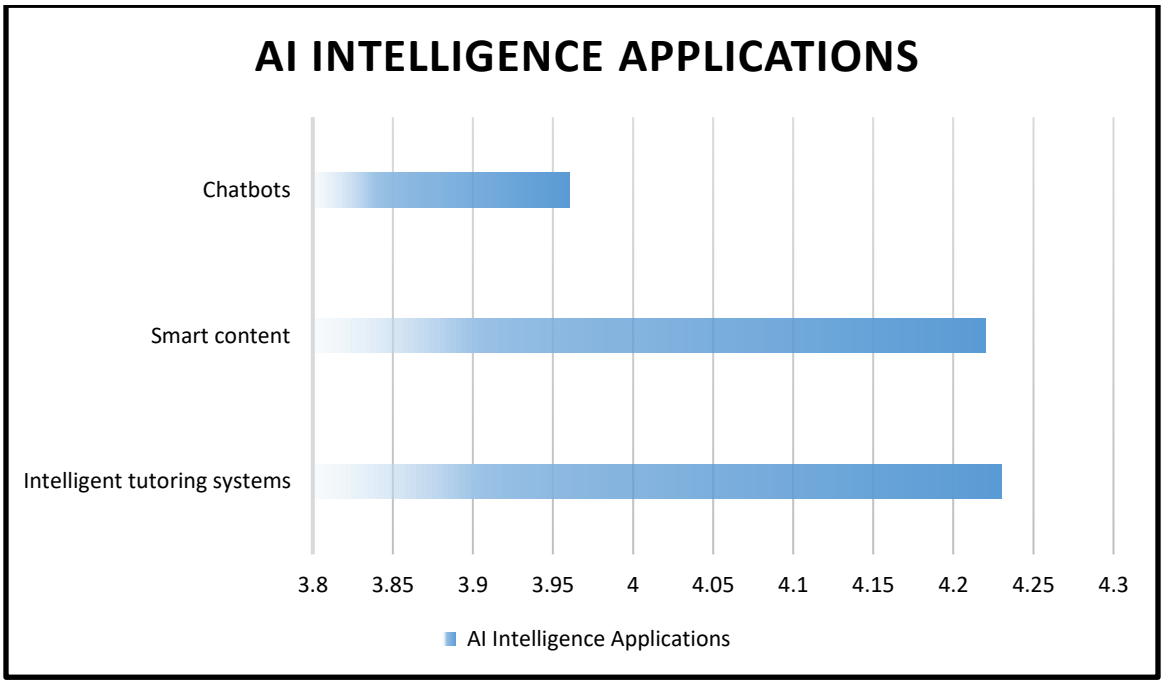

Figure 1

Means of Participants' Responses Regarding AI Intelligence Applications

What is the level of learning outcomes exhibited by pre-service social studies teachers?

Table 4 shows that the second axis's overall mean score (M=4.10; SD=.510) was rated as "high," indicating that pre-service social studies teachers possess high levels of academic, professional, and self-growth skills.

Table 4

Means and Standard Deviations of Learning Outcomes Subscale

No.	Subscales	M	SD	Rank	Degree
1	Academic skills	4.08	.546	2	High
2	Professional skills	4.05	.564	3	High
3	Personal growth	4.18	.560	1	High
Overall mean		4.10	.510	High	

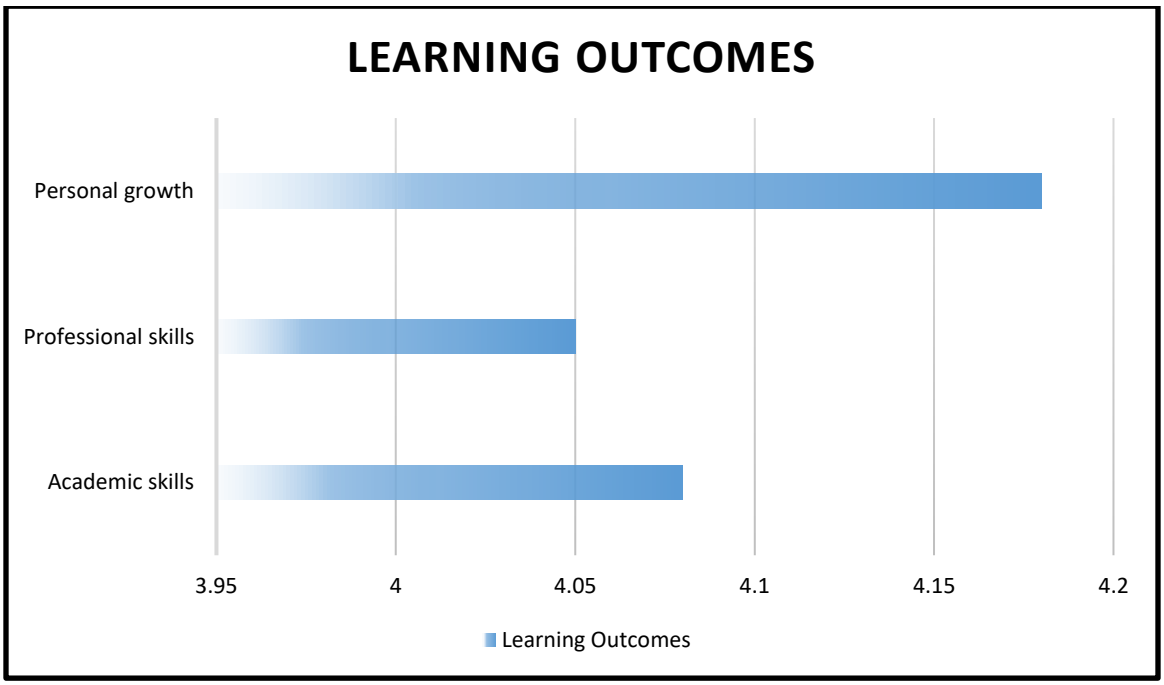

Figure 2

Means of Participants' Responses Regarding Learning Outcomes Subscale

What impact does the integration of AI have on the learning outcomes of pre-service social studies teachers?

Table 5 shows that AI applications had a statistically significant positive impact on the learning outcomes of the study participants. The R-value was .727. with a significance level of .000,

indicating that the use of AI applications explains 52.9% of the variation in learning outcomes (R^2=.529).

Table 5

Impact of Using AI Applications on the Learning Outcomes of Pre-Service Social Studies Teachers

Independent variable	B	Beta	R	R^2	T-value	Sig.
AI applications	.914	.727	.727	.529	10.484	.000
Constant	.321					
Adj R2	.524					
F. value	109.919					

Discussion, Conclusion and Implications

Discussion

The results pertaining to the first research question regarding the extent of AI use by pre-service social studies teachers show that they possess a strong grasp of the value of AI in education and are skilled at integrating AI into their lessons. Findings indicating a "high" level of efficiency and effectiveness among participants in utilizing AI applications suggest not only the proficiency of pre-service teachers in employing AI technologies but also their deep understanding of the importance of AI technology in enhancing educational practices.

The result indicating an overall mean score of 4.14 (SD = 0.406) on the first axis suggests that pre-service social studies teachers are highly proficient in using AI applications within their learning process. This high score reflects their efficiency and effectiveness in integrating AI tools into their educational practices and their strong recognition of the significance of AI technology in enhancing educational outcomes. It highlights that these teachers utilize AI applications effectively and grasp the critical role these technologies play in modern education.

Furthermore, the data reveal that participants demonstrate particular competence in utilizing Intelligent Tutoring Systems (ITS) and Smart Content, showcasing their ability to leverage advanced AI tools to optimize teaching strategies and promote student engagement and learning outcomes. This is probably because the robust learning environments and interactive learning offered by AI help the participants learn better (Luckin & Holmes, 2016). This finding is consistent with Yang's (2022) remarks on the value of technology in advancing the learning process and

leveraging intelligent applications to enhance teaching methods. He also highlighted the advantages of using AI in language instruction, as chatbots can foster communication and improve student evaluation procedures. Pre-service social studies teachers must understand the role of AI in education for several reasons. AI improves personalized learning by enabling educators to meet the various demands of students. It promotes data-driven instructions, which facilitate assessment and adaptation. AI competencies prepare teachers to navigate the changing educational landscape and provide effective and technology-savvy teaching.

For instance, the high overall mean score indicates that participants were proficient in using AI applications and recognized the importance of AI technology in education. This aligns with Maqbool et al. (2017), who highlighted how AI revolutionizes education by improving student experiences and providing innovative tools for personalized learning. Similarly, Nguyen (2023) emphasized AI's role in supporting teachers through tools like automated essay scoring and the Inq-Blotter Teacher Dashboard, reflecting the efficiency and effectiveness observed in this study. Similarly, the high mean score suggests that pre-service social studies teachers have developed strong academic, professional, and self-growth skills. This finding is consistent with Bektas (2021), who reported that pre-service teachers enhanced their thinking skills and professional abilities through targeted activities. Additionally, the results of Shifflet and Hunt (2019) and Kartal (2020) support the importance of comprehensive preparation and integration of curricula, which can contribute to developing these skills.

On the other hand, the statistically significant positive impact of AI applications aligns with studies such as Dharma and Lestari (2022), who demonstrated that problem-based learning, supported by AI, enhances critical thinking and social studies learning outcomes. Tsai et al. (2021) also found that AIOT implementation significantly improved students' learning engagement and outcomes. Similarly, Salas-Pilco (2020) and Alam (2023) highlighted how AI and robotics can enhance student learning experiences, contributing to better learning outcomes. The findings in relation to the second research question regarding the level of learning outcomes suggest that pre-service social studies teachers exhibit high academic, professional, and self-growth skills. These skills can be further enhanced through practical training, which could incorporate AI applications and be integrated into the undergraduate course curriculum as well as during their tenure in schools when they are working as teachers. Functional training, including AI integration, is essential to ongoing professional development programs for teachers as it bridges the gap between theory and

application. This integrated approach serves as the foundation for educators to develop their teaching abilities and acquire educational knowledge effectively.

Similarly, Ramirez (2020) emphasized the need for pre-service and professional development programs for teachers to raise educational standards and prepare them for global competition. Ramirez (2020) also emphasized the importance of training pre-service social studies teachers in planning lessons, defining learning objectives, presenting educational content, and evaluating results. Thus, it is necessary to train pre-service social studies teachers in strong practical application, critical thinking, and analytical skills.

The result showing an overall mean score of 4.10 (SD = 0.510) on the second axis indicates that pre-service social studies teachers exhibit high levels of academic, professional, and self-growth skills. This "high" rating reflects their substantial achievements in these areas, demonstrating that these teachers are advancing their knowledge and skills in their academic and professional domains and experiencing significant personal development. This suggests that the learning outcomes for these pre-service teachers are robust, encompassing comprehensive growth across various aspects of their educational and professional journeys.

Consequently, the findings related to the third research question about the educational impact of AI show that AI effectively improved the participants' learning outcomes. Based on the participants' responses, gaining access to high-quality personalized educational resources and tools helped improve the learning outcomes. Thus, it is beneficial to integrate AI into teacher training. This finding agrees with Koh et al. (2021), who showed that an Automated Response System positively affects teachers' learning outcomes.

The result indicating that AI applications have a statistically significant positive impact on learning outcomes, with an R-value of 0.727 and a significance level of 0.000, demonstrates that integrating AI tools substantially enhances the educational achievements of pre-service social studies teachers. Specifically, the finding that AI applications account for 52.9% of the variation in learning outcomes ($R^2 = 0.529$) suggests that more than half of the improvements in learning outcomes can be attributed to the use of AI. This underscores the significant role that AI technologies play in boosting the effectiveness and quality of education for these pre-service teachers.

Based on these results, it can be concluded that integrating AI into the training of social studies teachers can improve the quality of training and help achieve educational goals. Wu and Yu (2023) concluded that AI, particularly chatbots, significantly impact students' learning outcomes, with the

novelty benefits of AI chatbots potentially increasing learning outcomes in brief interventions but fading with longer interventions. AI has tremendously impacted student learning outcomes by providing personalized learning, data-driven insights, and increased engagement. It adapts to individual needs, provides vital feedback, and fosters a dynamic learning environment, eventually enhancing the comprehension and retention of course information, leading to more successful educational experiences.

Moreover, Xu and Babaian (2021) stated that AI has been more prevalently applied in computing and engineering, and the introduction of AI to a wider range of academic fields is still in process. Ideally, more exposure to AI tools for teachers and pre-service teachers would increase the integration of AI in education, as they would pass on their knowledge of AI-based learning to their pupils.

Although AI has advantages, such as personalized and interactive learning and providing formative assessment and feedback prompts, it has intrinsic limitations, such as producing inaccurate and biased information. Since its release, baidoo-Anu and Ansah (2023) noted that ChatGPT has elicited conflicting opinions. Hence, it is essential to thoroughly analyze educational materials produced by or supported by AI before using them in the classroom.

Conclusion

The results indicate that pre-service social studies teachers at Kuwait University's College of Education are well-versed in incorporating AI into the learning process and have successfully achieved better learning outcomes through AI use. Practical training improves teachers' skills and prepares them for the job market. Overall, using AI apps helps pre-service social studies teachers learn better, improving teacher training quality.

The adoption of AI in education is still in its early stages, with many more advancements and upgrades to be discovered and developed in the future. The employment of AI tools in the educational landscape is promising, and an increasing number of technological integrations is expected. The high mean scores in Tables 3 and 4 reflect the participants' proficiency in utilizing AI applications and their well-developed academic and professional skills, resonating with the findings of previous studies.

Therefore, it can be concluded that AI can revolutionize teaching in more ways than ever imagined, but it is still up to us to control and provide input before AI can perform any task, as well as double-check the outputs created. The benefits of integrating AI into the university educational system are limitless, including, but not limited to, the following: easier analysis of students' learning patterns to adapt the curriculum to their individual needs; automation of administrative tasks such as grading and scheduling; making education more accessible to students with disabilities; analysis of large volumes of data to identify trends and patterns in student performance; automating tasks and improving resource allocation; and making the educational system competitive with the global scene, especially in terms of technological advancements. For the Kuwaiti education system to keep pace with technological advancements and the demands of the job market, it is recommended that investments be increased and various AI applications integrated more extensively into the university education system. Training courses and workshops on the effective use of AI applications are also necessary for social studies teachers. Social studies teachers who attend training courses and workshops will be better equipped to use AI tools to create more dynamic, flexible, and technologically advanced learning environments. This will ultimately benefit both teachers and students in the ever-changing educational landscape. Kuwait can benefit from other developed nations' experiences in using AI technology to create a more efficient higher education system.

Alignment with the theoretical framework

The findings seem to cohere with the main assumptions of the theoretical framework of the current study, as follows:

- **Continuous learning and development:** The findings align with the idea of continuous learning and development by emphasizing the importance of practical training for pre-service social studies teachers. This training equips them with the skills necessary for their professional growth and readiness in the job market, illustrating the progressive development of expertise through systematic advancement.
- **Impactful advancements**: This study highlights the influence of both internal (such as instructors' understanding and skills) and external factors (such as the integration of AI technology) on learning outcomes. This underscores the need for

a comprehensive approach to incorporating AI, including increased investments and training, to enhance educational quality and achieve the desired learning outcomes.

- **Personalized learning:** The conclusion supports the necessity of personalized learning by advocating for AI's role in tailoring educational content to meet individual students' needs. AI's ability to analyze learning patterns and automate tasks helps create dynamic and flexible learning environments, fostering a more personalized and effective learning experience for teachers and students.

Future directions

Future research should examine aspects such as using AI applications to meet the evolving job market demands in Kuwait, how to integrate AI in learning assessments to cater to students with special needs, the pros and cons of using generative AI, the prevailing issues on the unethical use of AI in fabricating and spreading of false historical claims and fake news, and the future of AI and how it could affect the current methods of teaching in the field of social studies. Furthermore, more research should be conducted on the role of AI in helping social studies teachers at Kuwait University's College of Education understand the concept of self-learning. These investigations may yield important new information about the interplay between the adoption of AI, educational readiness, and labor market adaptation in the Kuwaiti setting.

This study has several limitations that should be addressed in future research. Firstly, it did not delve into the specifics of which AI applications improved particular types of learning outcomes, leaving a gap in understanding the nuanced impacts of different AI tools. Additionally, the study did not account for variations in the extent and type of AI use among participants, which could influence the generalizability of the findings. Moreover, the research was conducted within a specific context at Kuwait University's College of Education, potentially limiting its applicability to other educational settings or regions. Importantly, all participants in this study were female, which may affect the generalizability of the findings to a broader population. Addressing these limitations in future studies could provide a more comprehensive understanding of the role of AI in education and its potential to enhance learning outcomes across diverse contexts.

Implications

Integrating AI tools into pre-service training programs can significantly enhance teaching proficiency and learning outcomes. The high proficiency levels observed among pre-service social studies teachers indicate that AI not only aids in personalized learning and data-driven instruction but also prepares educators to adapt to the rapidly evolving educational landscape. Consequently, increased investments in AI technologies and targeted training workshops are needed to equip teachers with the necessary skills to leverage AI effectively. By fostering continuous professional development and personalized learning, AI can play a pivotal role in improving the quality and competitiveness of the educational system in Kuwait and beyond.

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