Reshaping the Teacher Education with Artificial Intelligence: Insight from pre-service Teacher Education

Shumaila Saeed[1] and Dr. Muhammad Ilyas Khan Khalil[2]

Abstract

This study explored the role of artificial intelligence in enhancing pre service teacher training and shaping the future of education. A qualitative research design was employed to gain in depth insight into pre service teacher's experiences with AI tools. The objectives of this study to explore the role of AI in enhancing pre service teachers training that determine the future of education. For this purpose using purposive sampling, ten pre services teachers of Pakistani university who had prior exposure to AI-based tools participated in semi structured interviews? The data were analyzed through thematic analysis, resulting in major five themes: educational benefits of AI, the role of AI in future education, the need for training in teacher education, the irreplaceable role of teacher, and challenges and risks associated with AI integration. The finding reveals that participants generally regarding over reliance on AI training and its potential impact on critical thinking. The study also emphasizes the necessity of structured AI training in to teacher educator's programme to ensure its effective and responsible use. Importantly, participants agree that while AI can support teaching practices, it cannot replace the human role of teacher in providing guidance, emotional support, and critical thinking. This study conclude that a balanced and well planned integration of AI in pre service teacher education can significantly improve teaching effectiveness and prepare future educators for evolving educational environment.

Key Words: Artificial intelligence (AI), Pre-service teacher, Teacher education, Educational Technology

[1] Ph. D Scholar, Department of Education, IISAT University, Gujranwala, Pakistan. Shumailasaeed626@gmail.com
[2] Directorate of I.T, Abdul Wali Khan University Mardan. ilyaskhalil@awkum.edu.pk

Introduction

Pre-service teacher education programs are intended to prepare students for a professional career in teaching. This process serves as an introduction and initiation, with an open-ended structure that promotes ongoing development and provides trainees with critical self-directed learning skills through projects, customized assignments, hands-on experiences, and practice teaching, among other activities (Das & Biswas, 2024).Pre-service training is crucial for influencing the trajectory of educational practices by preparing educators with critical competences and perspectives. The introduction of artificial intelligence into training syllabus expands pedagogical techniques and allows tailored learning experiences, allowing educators to more effectively handle students' diverse needs (Lee & Kim, 2024).

In recent era education faculties are essential in helping teachers become professionals by giving them the experiences, knowledge, and abilities they need to succeed in the classroom and have a positive impact on thee scholars' life. It is necessary to investigate the tactics in pre-service programs at faculties of education (Akhyar, 2023). AI technology has been emerged, it also affect the field of education. Especially in pre service teacher training it is very helpful for the better future of education. Since 2022, the technology that generates an example of this, artificial intelligence (AI), has quickly matured and demonstrated significant potential for a variety of low tasks (Lin, 2022).These technical achievements catalyze the growing interest in the integration of previous innovations in AI from grounds such as usual handling and processor idea in learning conditions, which will form an exceptional field of research (Le et all, 2024)

So the researchers are increasingly studying in what way the AI tools can improve education and wisdom procedures using tools such as chat boots, data, decision making, and tools for analyzing training behaviors (Zhang, 2021). However, this trend is not without contradictions. Fears have been revealed about AI reducing the role of teachers, impairing the quality of education, or unhelpfully affecting scholars' reasoning growth (Chan, 2023).Although these issues, the university remains motivated on studying the benefits of possible claims and AI tools in educational practices.

More ever the professional educators need to be well-versed in pedagogy and instructional strategies (Ahmed, 2019). Teachers must have a thorough understanding of child development and psychology in order to establish welcoming learning environments. Education programs emphasize the importance of knowing how children learn and develop at different ages. Inclusive education has a significant

influence on current education. Education faculties equip instructors to meet the requirements of various pupils, ensuring that every student feels included and respected (Anderson, 2007). AI can foster global connections between teachers, allowing them to share knowledge, best practices, and study with other local experts (Iskakova, 2024).

AI-driven network sites and virtual mentors require teachers to connect with experienced teachers and materials specialists. Artificial intelligence translation software also lowers language barriers, allowing multilingual educators to work more effectively (Sun et al, 2020). As linked technologies and AI grow, the policy must manage the challenges and risks of AI adoption while conforming to global norms. An integrated approach that encompasses workforce development, institutional modernization, and ethical AI governance would help Pakistan retain its future national competitiveness while also increasing inhabitants' overall quality of life (NAIP,2025).

Education is critical for determining how society will grow in the future. A well-rounded learning environment and pupil nurturing are necessary, and they must be promoted by qualified teachers. The excellence of educators is critical in defining the global educational quality of a institute or organization (Calderon et al, 2021).A skilled, knowledgeable, and dedicated teacher has a major impact on their students' learning experiences and outcomes (Akhiyar, 2023). Pre-service training is crucial for influencing the trajectory of educational practices by equipping aspiring educators with critical competences and perspectives. The introduction of artificial intelligence into training curriculum expands pedagogical techniques and allows tailored learning experiences, allowing educators to more effectively handle students' diverse needs (Lee & Kim, 2024).

So the professional educators need to be well-versed in pedagogy and instructional strategies (Ahmed, 2019). Education faculty train future teachers a variety of instructional tactics and techniques aimed to engage students and build effective learning experiences (Awad, 2018).Education faculties equip teachers to meet the needs of various pupils, ensuring that each student feels included and valued (Anderson,2007).

On the other hand, these artificial intelligence tools are not only capable of creating text and graphics, but they can also execute sophisticated activities such as programming and writing creative messages (Denny,2024). This significantly increases the number of AI applications in education, as well as the flexibility and speed with which content production and tailored training routes are developed.AI can help teachers form global connections, share knowledge and best practices, and collaborate with other local experts (Iskakova, 2024).

Network sites based on AI and virtual mentors force teachers to create links with experienced teachers and materials experts. Artificial intelligence translation software also breaks down language barriers and enables multilingual background instructors to work effectively (Sun,2020).

Moreover the educational environment is quickly transformed through the integration of artificial technologies (AI) particularly the integration of technologies that generate AI).Teacher training programs around the world are facing ways to include these technologies in their programs, ensuring that future teachers do not have experience using AI tools, but can also teach students to be critical and responsible for their students. The fast step of technical progress is both an opportunity and issue for educational facilities that require thoughtful consideration in the best way to prepare educational education training (Andrii, 2025). As technologies and AI evolve, the plan must address the obstacles and dangers of AI adoption while adhering to global norms. An integrated approach that includes workforce development, institutional modernization, and ethical AI governance would assist Pakistan maintain its future national competitiveness while also improving residents' overall quality of life (NAIP, 2025)According to UNESCO, one major issue is that vendors often push AI-based solutions in their early, unproven stages, prioritizing innovation over practice. This tendency ignores the real and ongoing challenges that instructors face on the front lines, so widening the gap between technology innovation and classroom demands. As a result, knowing and fulfilling teachers' genuine needs and views should be critical in any effort to effectively integrate AI-based solutions into educational practice (UNESCO, 2025).

Research objective

To explore the role of AI in enhancing pre service teachers training that determine the future of education.

Research Question

How does AI influence strategies pre service teachers training programme that determine the future of education?

Statement of Problem

Pre-service teacher education via AI is vital for future teachers with the abilities and awareness necessary to teach effectively. However, in Pakistan, most teacher training programs still depend on traditional methods and do not fully integrate modern technologies such as artificial intelligence (AI).

As education systems rapidly change, teachers need to become familiar with artificial intelligence tools to improve lesson planning, student AI-created assessment, and personalized learning. Unfortunately, many teachers have limited use of teaching tools, impacting their confidence and readiness for the future of teaching. Additionally, there is little research on how AI can maintenance in-service teacher learning and what expectations professional teachers have for AI in education. Therefore, this study goal is to explore the role of artificial intelligence in improving teachers' pre-service preparation and understand how AI can help teachers prepare for the future of teaching.

Methodology

This chapter defines the methodological structures used to study the integration of artificial intelligence tools in pre teacher training and their impact on educational outcomes before initiation. This methodology aims to give an organized solution to the purpose of education and the provision of complete information on the awareness, experience and skills required for the effective integration of artificial intelligence in educational programs.

Research Design

A qualitative research approach was used to investigate pre-service teachers' perspectives of the use of artificial intelligence (AI) in their training. A qualitative design is suited for in-depth understanding of participants' life experiences, beliefs, and attitudes (Merriam & Tisdell, 2015).Semi-structure questionnaire was used to explore the pre-service teachers. The interview protocol was consisted into 10 questions. Interviews question were developed to explore reason behind the trends observed in survey data. The interviews were conducted in person, took 40 to 60 min, and were conducted in English.

Sampling and Participant details

Purposive sampling was utilized to choose individuals who have relevant expertise with or exposure to AI tools as part of their teacher education program (Patton, 2015).The participant were selected based on the specific inclusion criteria (a) enrollment in a pre-service teacher training program at IISAT university, and (b) use of at least one AI-based product (e.g., Chat GPT, Grammarly, or AI-powered lesson plans) while studying.

The 10 pre service teachers of IISAT University were selected for this study. Semi structured interviews were conducted to explain the qualitative findings, provide deep understanding of participants experiences and opinion.

Ethical Consideration

The researchers' university's institutional review board provided ethical approval. Participants were approached through personal contacts and university networks. They were informed about the purpose of study and those who showed willingness to participate were selected and informed consent was obtained prior to data collection. All participants gave informed consent after learning about the study's purpose, voluntary nature, and freedom to withdraw at any time. Personal information was removed to maintain confidentiality.

Qualitative Analysis

Thematic Analysis was used to assess the qualitative data acquired during semi-structured interviews. Ten interviews with pre-service teachers were recorded and transcribed word to word to ensure accuracy. The researcher thoroughly analyzed the transcripts many times to inform him with the data and again and again so better understanding of the members' perspectives. The examination followed and organized coding approach. During the initial phase, significant statements and phrases about the use of artificial intelligence in teacher training were identified and assigned preliminary codes. In the second stage, similar codes were classified based on common concepts and patterns. To ensure consistency and precision, the themes were repeatedly evaluated and contrasted with the initial data set. The coding process was conducted manually using MS word, where important text was identified. The analysis resulted in five major themes describing participant's perception toward the role of AI.

Theme 1

Educational benefit of AI

The significant them emerging from the interviews was the educational benefit of AI. Participants emphasize that AI tools can enhance the learning experience by providing quick access to information and it also helps the students in completing their assignments and tasks. Participants 1, 3, 7 and 9 stated approximately same statement:

AI provides any educational resources that help students learn more effectively.

These findings suggest that AI can play important role in improving both teaching practice and students learning.

Theme 2

Role of AI in Future Education

One of the most prominent theme emerge from the interview was the belief that AI will play significant role in shaping future of education. Most interviewers indicated that AI technologies have potential to transform teaching practices and improve the learning experience in classroom. Participants believed that AI could support innovative teaching methods; assess quick information and designing new effective lesson plans.

Participant 2 explained

AI will definitely have a important part in shaping the future of learning.

Another participant emphasized that technological advancement will continuous to influence education, making AI an essential need of modern teacher training. All responses suggest that teachers recognize the growing importance of AI in education.

Theme 3

Need for AI training in pre service teacher education

Another major theme identified in the analysis was the need for proper preparation of pre-service instructors to effectively use AI technology**.** Participants emphasized that successful integration of AI in education require proper understanding, skills and training. Without it there is a risk that educators may struggle to utilize AI effectively.

Participant 7stated

Teaching is very important. If teachers re fully trained they will know how to get the most benefit from AI.

This finding highlights the importance of capable development creativities in preparing future teachers to take part in emerging tools in classrooms.

Theme 4

AI Can't Replace the Teacher

This theme reflects participant's trust that although AI can sustenance education and learning process but it cannot fully replace the role of teacher. All participants emphasized that the role of teacher remain essential in guiding students, providing emotional support and developing critical thinking that cannot done by AI. Participants 1 , 2,3,4,5 ,7,9 and 10.

AI can support teaching, but cannot replace the teacher's role in guiding students.

These responses indicate that participants view AI as a complementary educational tool rather than a substitute for human teachers.

Theme 5

Challenges and Risks of AI Integration

Despite acknowledging the benefits of AI, participants also show concern regarding challenges associated with the use of AI. One major concern was the possibility that students might rely excessive on AI generated information without evaluating its accuracy. Participants emphasized that blind dependence on AI might adversely distress student thinking and problem solving abilities.

One participant explained

If students blindly follow whatever AI suggests without thinking critically, it can weaken their thinking and problem solving abilities.

This show that although AI offers numerous advantages, careful implementation and monitoring are necessary to prevent misuse and maintain educational quality.

Table No: 1 *Summary of Emergent Themes*

Themes	Description
Educational Benefits of AI	AI improves learning, provide resources and support assignments.
Role of AI in future Education	AI will influence future classroom and teaching methods.
Need for AI training in pre service teachers	Teachers need proper training to use AI
AI cannot replace teachers	Human interaction and guidance remain essential.
Challenges and risks of AI	Risks include misinformation and reduce critical thinking.

The thematic analysis highlighted five significant themes concerning the integration of AI in pre-service teacher preparation. Participants emphasized the educational benefits of AI and its potential role in changing the future of education. At the same time, they underlined the importance of good AI training and responsible technology use. The findings also indicate that, while AI provides numerous benefits, it cannot replace the function of teachers in the educational process.

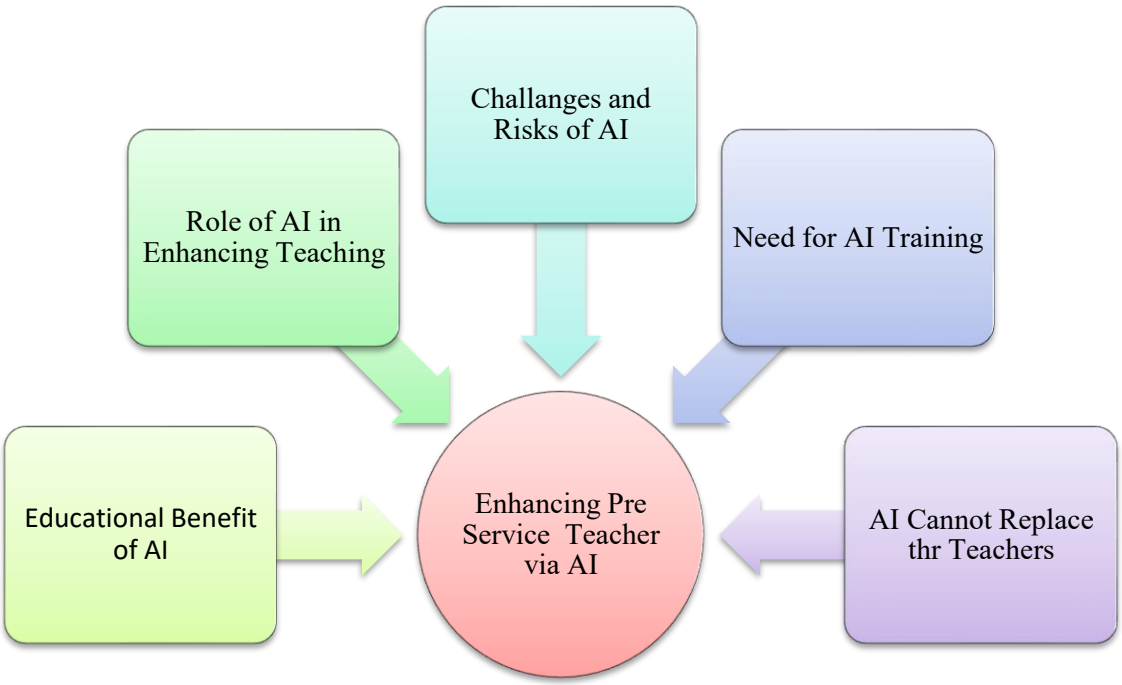

Figure 1: *Thematic Map of AI integration in pre-service teacher training.*

Discussion

The present study explores the role of AI in enhancing pre-service teachers training from the perceptive of pre service teachers. The finding revealed that the participant generally hold the positive attitude toward the integration of AI in education, while also recognizing certain limitation and risks. The first major finding show the educational benefits of AI, where participants reported that AI tools provide quick access to information and support learning tasks. This finding align with previous studies (Lee & Kim, 2004), which emphasize personalized learning and improve instructional efficiency. The participant response suggests that AI can enhance both teaching practices and student learning experiences by offering adaptive and accessible resources. Another important theme was the role of AI in shaping the future of education. Participants strongly believed that AI will transform teaching methodologies and class room practices. The finding suggests that pre-services teachers aware of growing importance of AI and recognize its potential to innovate lesson planning.

This study also identified a strong need for AI training in pre service teacher education. Participants emphasized that without proper training, teachers may struggle to effectively integrate AI in to their

teaching. This supports the arguments that teacher education must incorporate technological competencies as a core component of training.

Finally the study revealed challenges and risks associated with AI integration, particularly the concern that student may become overly dependent on AI tools. The findings demonstrated that while AI offers significant opportunities for improving teacher training, its successful implementation requires careful planning, proper training and responsible uses.

Conclusion

This study examines the role of AI in enhancing pre-service teacher training. The findings indicate that AI has the potential to significantly improve educational practices by providing accessible resources, supporting personalized learning and enhancing teaching strategies. At the same time, the study highlights the importance of preparing future teachers to use effectively through proper training. Although AI can support teaching and learning process but it cannot replace the essential role of teachers in guiding, motivating and supporting students. In conclusion, AI should be integrated into pre-service teachers education as a supportive tool, while maintain the central role of teachers in the educational process. A balanced and informed approach to AI integration can contribute to the development of effective and future ready educators.

This study analyzed how artificial intelligence (AI) may improve pre-service teacher training for future Pakistani teachers. The study found that pre-service instructors have a positive yet cautious attitude towards AI. They understand the educational benefits of AI, such as quick access to information and lesson preparation support, and feel it will play an important role in defining the future of education. While emphasizing the importance of formal AI training, they also caution against over-reliance, which can harm critical thinking.

References

Akhyar, Y. (2023). Teachers' Pre-Service Programs Curriculum to Prepare Professional Teachers at Education Faculties. *Indonesian Journal of Islamic Educational Management*, *6*(2), 72. https://doi.org/10.24014/ijiem.v6i2.25044

Calderón, D., Soler, S., Borja, M., Muñoz, G., Rojas, G., Medina, G., et al. (2014). Referentes curriculares con incorporación de tecnologías para la formación del profesoradode lenguaje y comunicación en y para la diversidad (2ª edición). Bogotá: Universidad Distrital Francisco José de Caldas.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Lawrence Erlbaum Associates.

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). SAGE Publications.

Das, R., & Biswas, S. (2024). The Significance of Pre-service Teacher Education Program For The Improvement of School Education. *International Journal of Humanities, Engineering, Science and Management*, *5*(2), 06–16. https://doi.org/10.59364/ijhesm.v5i2.290

Field, A. (2018). Discovering statistics using IBM SPSS statistics (5th ed.). SAGE Publications.

George, D., & Mallery, P. (2003). SPSS for Windows step by step: A simple guide and reference (4th ed.). Allyn & Bacon. https://doi.org/10.1016/j.caeai.2024.100355

Koehler, M. J., Mishra, P., & Cain, W. (2013). What is technological pedagogical content knowledge (TPACK)? *Journal of Education*, *193*(3), 13–19. https://doi.org/10.1177/002205741319300303

Kolhatin, A. O. (2025). Generative artificial intelligence in teacher training: A narrative scoping review. *Computers and Education: Artificial Intelligence*. Kryvyi Rih State Pedagogical University. https://doi.org/10.55056/cte.920

Lee, D. Y., & Kim, J. D. (2024). Pre-service Teachers' Perspectives on the Integration of Technology in Future Education: Between English Education and Ethics Education Majors. *Korean Journal of General Education*. https://doi.org/10.46392/kjge.2024.18.2.97

OECD. (2023). *OECD Digital Education Outlook 2023: Towards an effective digital education ecosystem*. OECD Publishing. https://doi.org/10.1787/c74f03de-en

Runge, I., Hebibi, F., & Lazarides, R. (2025). Acceptance of Pre-Service Teachers Towards Artificial Intelligence (AI): The Role of AI-Related Teacher Training Courses and AI-TPACK Within

the Technology Acceptance Model. *Education Sciences*, *15*(2), 167. https://doi.org/10.3390/educsci15020167

Shezad, F., Goswami, R., Shaheen, A., & Khan, I. (2025). AI in Teacher Training and Professional Development: A Tool for Continuous Learning and Skill Enhancement. *Review of Education, Administration & Law*, *8*(1), 179-191.

Tashakkori, A., & Teddlie, C. (Eds.). (2010). *SAGE handbook of mixed methods in social & behavioral research* (2nd ed.). Sage Publications.

UNESCO. (2021). *UNESCO's Input in reply to OHCHR report on the Human Rights Council Resolution 47/23 entitled "New and emerging digital technologies and human rights"*. Paris: UNESCO.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

X., Cheng, G., & Ling, M. H. (2025). Artificial intelligence in teaching and teacher professional development: A systematic review**.** *Computers and Education: Artificial Intelligence, 6*,]. Elsevier.