Teachers at the Intersection of Artificial Intelligence and Pedagogy: Exploring AI–Enhanced Teaching Practices in Secondary Education

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ABSTRACT: Artificial intelligence is gradually shifting education by assisting teachers in enhancing teaching for each student, modifying their pedagogical approaches, and achieving better classroom results. This qualitative study explored how secondary school instructors deal with the nexus between pedagogy and Artificial Intelligence (AI) in modern classrooms. Teachers are gradually using AI tools like Chat-GPT and Gamma to improve teaching methods, personalize learning, and nurture student engagement since they are at a critical crossroads. The study, grounded in an interpretivist paradigm, used a phenomenological design to record secondary school teachers' actual experiences. Five teachers were interviewed through semi-structured interviews using a strata purposive sampling technique in a few chosen secondary schools in Mardan, Khyber Pakhtunkhwa. The results showed that teachers saw AI as both a challenge and an opportunity. Improved educational effectiveness, changing teacher roles, ethical issues, and the requirement for professional training are some of the major themes. While lesson planning, evaluation, and differentiated instruction are all aided by AI tools, instructors are concerned about over-reliance and the possible deterioration of students' critical thinking abilities. The results offer beneficial effects in teacher AI–technological, pedagogical, content, integrated knowledge in subject contexts, and teachers' ethical AI considerations for policymakers, educators, and curriculum designers, and add to the expanding conversation on AI in education, especially in developing environments.

KEYWORDS: Artificial Intelligence (AI), Pedagogy, Secondary School Teachers

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Introduction

Artificial Intelligence (AI) tools like Chat GPT and Gamma have the potential to increase educational access and boost student and teacher learning effectiveness. However, there are snags to its use, such as decreased transparency and issues with inclusivity and justice. Research indicated that although AI has many advantages, its application must be cautious in order to preserve the reliability of the educational system (Pham et al., 2023). With technologies like intelligent tutoring systems and adaptive platforms, artificial intelligence is changing education by making learning more adaptive and interesting for students. By providing modified assistance and faster feedback, these AI technologies fill in the holes in conventional instruction (Chiu et al., 2025).

Education is one of the most encouraging yet difficult activities where artificial intelligence is quickly escalating and having an impact (Capuano & Caballé, 2020). It helps teachers save time, enhance instructional approaches, and modify learning. But its growing use also raises significant and ethical issues that need thoughtful reflection (Köbis & Mehner, 2021).

In education, AI has the potential to improve education by creating learning that is more adapted, manageable, and helpful for students and policymakers equally (Varsik & Vosberg, 2024). But it also takes problems of fairness, inclusivity, and sincerity, predominantly in multicultural cultures. Careful attention must be given to complications such as a lack of confidence, moral dilemmas, and problems in the relations between teachers and students. AI has the potential to worsen unfairness and erode confidence in educational systems if it is used too soon without enough safeguards (Adli et al., 2024).

Teachers and students have experienced both confident and immoral effects as an outcome of the usage of AI in education (Felix, 2020). Teachers are now observing and monitoring learners' use of AI tools in the instruction process. However, some pupils rely too much on AI to finish tasks without fully understanding the fundamental ideas. According to Janjua et al. (2025), this change may have a control on profound learning and lower students' engagement with the physical data and capabilities.

Luan et al (2020) highlighted the cons and pros of operating AI in education. Building on this, the study provides teachers, policymakers, and designers with valuable advice. In order to endorse the increase of impartial, accountable, and manageable use of AI in education, it provides inducements for beneficial skills from the literature (Shah et al., 2025).

Problem Statement

Artificial Intelligence is rapidly changing how teaching and learning happen across the world. Teachers at the secondary school level are adapting to AI tools in their classrooms, exploring both the benefits and challenges they bring (UNESCO, 2024). Despite limited training for pedagogy skills, unequal AI access, and organizational funding, teachers in Mardan's secondary schools are under an increasing burden to integrate AI into their teaching. Moreover, teachers' ability to successfully implement AI-enhanced teaching approaches diverges throughout Khyber Pakhtunkhwa schools due to an inadequate approach to digital set-up and AI tools.

Significance of the Study

This study provides reliable, qualitative insights into the presentation of AI in education, predominantly in understudied emerging settings. It promotes the ethical and successful application of AI in instruction, ropes teacher skilled development, and leads policy and AI adoption initiatives (Holmes et al., 2024).

Purpose Statement

The purpose of the study was to understand secondary school teachers' experiences with and practice of AI tools in the instructional process. It tells how students see these tools, how they use them in their everyday lives, and how they adapt them to aid with learning. The study sought to highlight secondary school teachers' experiences of integrating AI tools into their educational approaches by focusing on their classroom understandings.

Research Question

1. How do secondary school teachers use AI tools to influence their instructional planning practices?
2. Why do teachers face challenges in the classroom implementation of AI tools?
3. How do teachers perceive issues such as privacy, bias, and academic integrity in AI-integrated teaching?

Research Gap for Study

The limited research on AI in education in Pakistan, particularly in Mardan and Khyber Pakhtunkhwa, has primarily focused on technological efficiency and quantitative outcomes. The lived perceptions of teachers in teaching-learning settings, when contextual issues like resource limitations, training disparities, and unequal access to technology are more noticeable, received very little attention. Furthermore, in this local context, the pedagogical significances and ethical problems related to the employment of AI tools in secondary education are not sufficiently examined. This stresses how important it is to comprehend how Mardan teachers view and include AI into their lesson planning and assessment (UNESCO, 2024; OECD, 2025; OECD, 2024).

Theoretical Framework

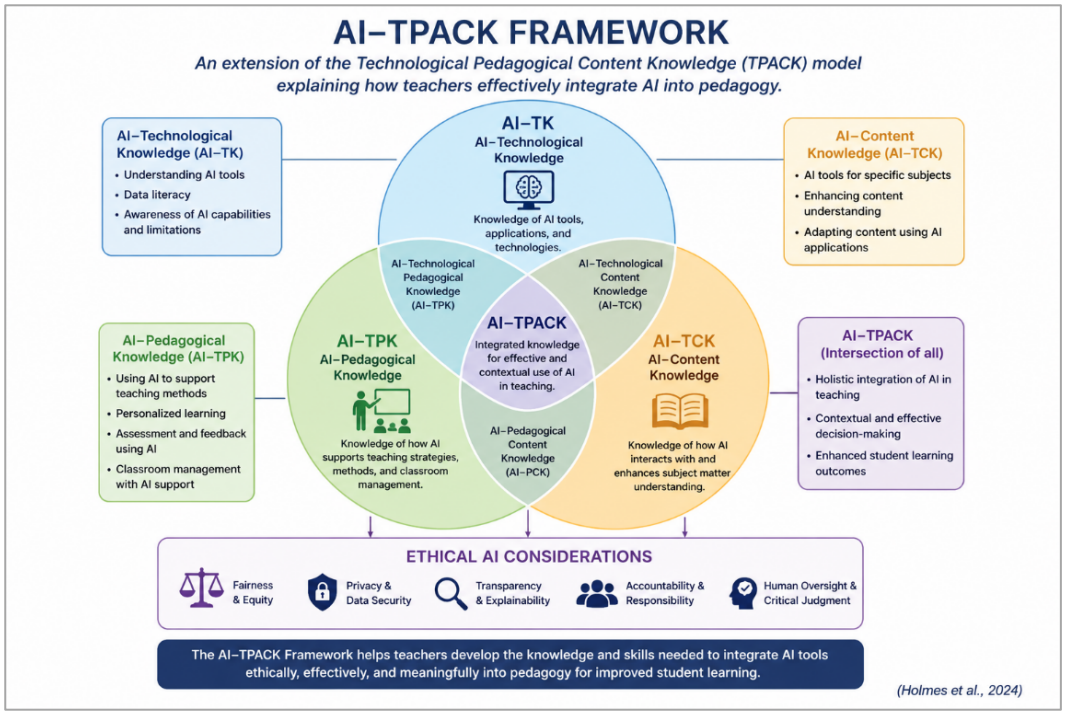
Based on the AI–TPACK paradigm, this study explores how teachers efficiently integrate AI into their lesson plans by tying together technological skill, pedagogical methods, subject matter knowledge, and ethical awareness in authentic classroom settings (Holmes & Zhgenti, 2024).

Table 1

AI–TPACK Component	Explanation	Main Dimensions	Contribution to AI-Supported Pedagogy
AI–Technological Knowledge (AI–TK)	Instructors' information on AI practice tools.	Knowing AI tools, the existence of their parameters, and skills	Practical use of AI ability in educational settings in an actual way
AI–Pedagogical Knowledge (AI–TPK)	Educators use AI for lesson planning and classroom processes.	AI-assisted classroom administration and personalized knowledge	Increase pupil input and instructional strategies.
AI–Technological Content Knowledge (AI–TCK Interaction)	AI tools improve the knowledge of subject material.	AI helps in content input, integration to a specific subject, and collective educational resources	For sustaining instructional tools for understanding the topic.
AI–TPACK (Integrated Framework)	Connect knowledge of content, pedagogy, and skill in AI for teaching.	Helped in the holistic learning outcomes of the topic	Framework for incorporating AI into instruction and knowledge as a significant technique.
Ethical AI Considerations	AI tools are employed for the correct and moral collection of information.	Fairness, equality, and morality are the ability for clarification, Critical outcome, and human omission.	Accepting the ethical, harmless, accountability application of AI in education settings.

Source: (Author, 2026)

Image 1



Literature Review

Teachers surely included Artificial Intelligence tools (Chat GPT, Gamma) into their instructional performance in ways that are instructionally comprehensive, in that context suitable, and ethically responsible. The AI–TPACK framework overturns the traditional Theoretical Content Knowledge (TPACK) model. It emphasizes that using AI tools in education competently requires not just perceiving how to apply technologies but also accepting how these tools interconnect with the theme, instructional methods, and classroom practicality (Chai et al., 2013).

AI tools upturned teaching methods, by means of AI to maintain subject consideration, and combined all three spaces intersection in the classroom application are the four interconnected domains that form a framework. Critically, the framework also places a strong stress on ethical awareness, pushing mentors to assess concerns like data safety, fairness, and the right application of AI in instruction space (Chiu & Lim, 2025).

Generally, it provides a more dynamic and correct perspective for understanding how educators progress from fundamental AI awareness to careful and academic combination.

Teacher AI–Technological Knowledge (AI–TK) in the subject

Teachers' acceptance of AI tools, their usage in basic technology, is referred to as AI-Technological Knowledge. It includes not just the demonstration of AI systems but also knowledge of their benefits, difficulties, and effects in learning settings. AI literacy has developed as a crucial ability for educators in the digital era, imposing both conceptual and real-world understanding of technologies like machine learning, adaptive learning platforms, and data-driven tools (Selwyn et al., 2025). Research revealed that while greater AI–TK allows for more meaningful integration in instructional planning, automated assessment, and personalized learning, poor AI know-how frequently limits teachers to basic uses of AI (Haq, 2025). Furthermore, educators who are more tech-savvy are more likely to be self-assured and open to applying AI-assisted teaching methods (OECD, 2025).

Teacher AI–Pedagogical Knowledge (AI–TPK) in Subject Contexts

The capability of instructors to apply AI to improve instructional design, teaching methods, assessment procedures, and classroom management is known as AI-Pedagogical Knowledge. In spite of merely helping as an extra tool, it tells the meaningful incorporation of AI as a support system that improves teaching and learning processes. According to recent research, AI can improve formative assessment, differentiated education, and timely student response by assisting teachers in better understanding each student's unique learning needs and modifying their instruction accordingly (Pawar, 2020). Teachers can determine learning gaps and make well-informed instructional decisions by using AI-based learning analytics, which also give real-time insights into student performance (Williamson & Eynon, 2020).

Moreover, studies showed that AI-TPK encourages a modification from conventional teacher-centered methods to more student-centered and flexible pedagogy, where AI enhances student involvement and personalized learning without taking the place of teachers in their skilled roles (Chiu et al., 2025). Effective AI integration, however, still relies on educators' critical thinking to make sure that technology complements, not replaces, good teaching approaches.

Teacher AI–Content Knowledge (AI–TCK) in Subject Contexts

This described the presentation of artificial intelligence techniques in subject-specific teaching to enhance conceptual understanding, bolster content delivery, and simplify difficult concepts for students. It focuses on how AI enables educators to provide content in more meaningful, dynamic, and captivating ways. According to research, AI-powered tools like intelligent teaching systems, generative AI applications, and simulation-based learning environments can progress learning in subjects like science, math, and languages by assisting students in better understanding real-world applications and visualizing challenging concepts (Kasneci et al., 2023). AI makes learning more individualized and accessible for a variety of learners by allowing adaptive details, multilingual translation, and instant content creation (Davis et al., 2024).

Nevertheless, experts warn that relying too much on AI-generated content could undermine teachers' subject-matter skills and increase the possibility of false information. Therefore, in order for teachers to critically assess AI outputs and uphold the correctness and academic integrity of classroom content, they still want to have a comprehensive understanding of the subject.

Teacher AI–TPACK (Integrated Knowledge) in Subject Contexts

In AI-supported tools in education, teachers effectively mix AI technologies with instructional preparation, classroom practices, and evaluation to improve learning. This is known as AI-TPACK, or the combined information of knowledge, pedagogy, and content. Teachers constantly adopt how to apply AI in accordance with their teaching objectives and topic needs through a flexible, context-based method that goes beyond just combining three domains (Mishra et al., 2023). Teachers with durable AI-TPACK assistance are able to involve students, personalize instruction, and improve learning outcomes because they can match AI tools with specific class objectives and modify education in real time, built on learners' requirements (Pawar, 2020). But research also directs that developing AI-TPACK involves ongoing professional development, thoughtful teaching practices, and strong official support. In the absence of adequate training and resources, teachers often remain at a basic level of AI use rather than accomplishing significant and innovative integration in their teaching and learning practice.

Teachers' Ethical AI Considerations

An important factor of the AI-TPACK paradigm is ethical concerns, which ensure the responsible, unbiased, and human-centered application of AI in education. Fairness, accountability, openness, data privacy, and the importance of human choice in AI-supported decision-making are a few of them. In fact, this means that instructors are in charge of ensuring that AI technologies maintain equal learning chances and defend students' rights in addition to using them. AI ethically is essential to avoid issues like algorithmic prejudice, improper use of student data, and unequal access to learning assistance. AI systems may inadvertently perpetuate discrimination or give pupils wrong advice if they are not closely monitored (Williamson & Eynon, 2020). In instructional environments, transparency is equally vital. In order to foster trust and avoid dependence on too much on "black-box" skills, mentors and pupils should have a fundamental understanding of how AI produces responses (UNESCO, 2023). The emergent use of AI also increases serious worries about information privacy and checking. Strict rules and teacher comprehension are essential to confirm that student data is handled ethically and safely (Selwyn, 2023). Mostly, ethical awareness is the managing concept that confirms the other components are used morally in classroom practice; it is not unlike AI-TPACK.

Methodology

Research Paradigm

The interpretivist paradigm approach (Acharya, 2025) was used for this study because it permits researchers to explore complex human experiences and contextual meanings in an in-depth investigation of subjective realities rather than generalizable realities.

Research Design

A phenomenological qualitative design was used to investigate secondary school teachers' understandings. This design emphasized how teachers interpreted and were familiar with AI-helping teaching in everyday educational contexts (Creswell & Poth, 2018).

Sampling Technique

A stratified purposive sampling technique was used for the collection of information from teachers. Teachers from various backgrounds of educational settings were identified, particularly those who are actively and significantly using AI-helping instruction methods. Key strata, such as school type, teaching experience, and degree of knowledge with AI software use, were acknowledged in the data collection procedure. Teachers who offer ironic, relevant, and information-rich understandings were then purposely selected from science and arts categories. Five teachers were considered sufficient in this qualitative design as the study focused on specific lived understandings rather than statistical generalization, underlining depth over breadth. Each educator provided substantial and nuanced thoughts on the application of AI in classroom exercises, confirming data adequacy through information abundance. The sample size was also in line with the principles of qualitative research, which state that smaller, carefully selected samples are appropriate when the aim is to achieve significant thoughts rather than representativeness, especially when interviewees have wide firsthand information of the phenomenon's actuality to study (Etikan et al., 2016).

Interview Protocol Details

Teachers' understandings of AI-supported teaching were carefully explored with the use of semi-structured interviews. No of questions with answers, recording, consent, and a record of the interview were recorded. Eight to ten open-ended questions completed the interview procedure, which was planned to provoke in-depth responses

concerning classroom actions, problems, moral predicaments, and pedagogical changes associated with AI incorporation. The duration of each interview was approximately 30 to 45 minutes, which gave applicants sufficient time to reflect and explain their practices. All interviews were audio recorded with participants' permission to ensure data completeness and correctness. Informed consent was developed before data collection, and applicants were assured of secrecy, privacy, and the freedom to withdraw at any moment. Following each interview, the recordings were precisely transcribed, and the accuracy of the records was thoroughly scrutinized in unification with the audio records. The qualitative data collected for the investigation were supplementary, consistent, and trustworthy.

Data Collection Tool

Semi-structured interviews were employed to collect information, permitting participants to freely express their opinions by guiding the discussion toward vital research topics. Teachers' potentials, problems, and opinions on participating in AI were better understood to adapt this tool (Kvale & Brinkmann, 2015).

Data Analysis Method

Thematic analysis was used to understand the qualitative information in a subsequent step-by-step process. First, the interview records were read and re-read to confirm understanding of the information. Second, initial codes were made by systematically classifying meaningful sections connected to teachers' practices with AI-supported pedagogics. Third, these codes were grouped into potential themes by gathering like patterns through the dataset. In the fourth phase, the evolving themes were studied and polished to confirm they correctly signified the coded information and the entire dataset. Fifth, clear definitions and names were allocated to each theme to apprehend their core. Finally, the themes were prepared and presented in relation to the research questions, which gave an interpretive understanding of teachers' viewpoints on AI integration in instruction and teaching (Braun & Clarke, 2006).

Findings

AI–Technological Knowledge (AI–TK): Teachers' Awareness and Operational Competence

"Teachers used Chat GPT and Gamma AI tools for awareness and operational competence to create lesson plans and received brief explanations, but many are still unclear about how these systems function or how to apply them successfully for more complex teaching activities like personalized learning". (Teachers' Responses)

Discussion

The result showed that many teachers were familiar with the awareness of employing AI tools (Chat GPT, Gamma), but they were not proficient in their complex pedagogical applications. For regular tasks like lesson preparation, topic summarization, and worksheet creation, the majority of teachers employ automated assessment systems and generative AI programs like ChatGPT. Research showed that instructors' proficiency with AI was still evolving since significant classroom integration does not always result from familiarity with AI technology (Zawacki et al., 2019). Although short-term training boosts instructors' self-assurance and awareness of AI skills, it often falls short of developing higher-level competencies like adaptive course planning and critical assessment of AI-generated content (Mishra et al., 2023). In rural and resource-constrained schools, where opportunities for ongoing professional development are still scarce, teachers' AI-TK is typically uneven and mainly shallow.

AI–Pedagogical Knowledge (AI–TPK): Integration into Teaching Practices

"Teachers used AI mostly for making lesson plans, creating quizzes, and getting quick explanations, but teachers still relied on their own teaching methods because AI does not always match their classroom needs."(Teachers' Responses)

Discussion

The findings showed that teachers were using AI to improve instruction, though mainly in a supportive rather than transformative way. AI tools were mostly used for tasks like lesson planning, exam preparation, subject clarification, and basic student provision without meaningfully changing present teaching practices. According to recent research, many educators still lack clear frameworks for effectively using AI in pedagogy, even though it increases effectiveness and rationalizes instructional strategy (Zawacki et al., 2019). AI is frequently viewed as a tool for efficiency rather than as a reagent for changes in education. Similarly, while AI can increase student participation in the classroom, it does not always result in more thoughtful changes to teaching strategies.

Some teachers who use AI infrequently or ignore it when essential have also expressed concerns about AI outputs being generic or out of line with curriculum needs (Qian, 2025). The overall result of the study showed that AI-TPK is still in its early phases, with teachers investigating with AI tools but not fully mixing them into innovative instruction approaches.

AI–Content Knowledge (AI–TCK): Subject-Specific Enhancement

"AI tools made complex subjects easier to understand, especially in maths and science. Before teaching the material to pupils, they usually double-check it. They used it to create examples and occasionally to display visual explanations. (Teachers' Responses).

Discussion

The result demonstrated that, particularly in maths and science subjects, instructors are increasingly employing artificial intelligence to increase the teaching of subject matter. AI tools aid in the interpretation of difficult thoughts, produce examples that are relevant to the subject, and convey information in interactive or visual formats that enhance student understanding. According to research, AI-TCK can improve the quality of education since teachers who successfully integrate AI with subject knowledge typically present lessons that are more theoretically sound and logical. Through virtual reality and adaptive clarifications, AI is especially useful in streamlining intellectual ideas. Nevertheless, instructors also mention their boundaries. Teachers frequently need to check and amend outputs before utilizing AI-generated content in the classroom because it is not always entirely correct or in line with curriculum requirements. This determines that keeping accuracy and significance still needs teacher skill. Additionally, some research suggests that if AI explanations are overused, deep intangible knowledge may be reduced (Kasneci et al., 2023). According to the results, AI-TCK expands topic training, but its efficiency depends on instructors' critical thinking and vigorous contribution in directing and appreciative AI use.

Ethical AI Awareness: A Critical and Emerging Dimension

"AI tools are beneficial for teaching, but students might abuse them for homework. Additionally, teachers are not completely sure about confidentiality fears and the safety of the data shared with AI technologies skills." (Teachers' Responses)

Discussion

Teachers often prompt concerns about the ethical presentation of AI in the classroom. Even though they admit its benefits, they are concerned about subjects with academic untruthfulness, students' over-reliance on AI tools,

information confidentiality, algorithmic unfairness, and the accurateness of pupil work. Research backs up this concern, showing that ethical awareness is an essential part of AI-TPACK and required to confirm fair-minded, accountable, and student-centered use of AI in classrooms settings. AI may by chance impair inequality or jeo-pardise academic truthfulness in the nonappearance of this moral base (Mishra et al., 2023). Teachers are more prepared to create classroom morals, make unbiased valuations, and encourage accountable pupil use since ethical guidance was unified into AI training (Holmes et al., 2022). Though, many instructors still find it difficult to decode ethical awareness into beneficial instruction methods. The results indicated that ethical AI attentiveness is essential yet still developing, imposing more formal provision and training to adjacent the information gap.

Conclusion

According to the study's findings, secondary school instruction and learning approaches could be significantly altered by integrating artificial intelligence tools into the AI-TPACK framework. Teachers are becoming more conscious of and applying AI tools, particularly to increase pedagogy training and content transference. Active presentation is exposed by difficulties like unequal admission to equipment, lacking official care, and a lack of training. Academic integrity, data privacy, and bias are just a few of the ethical challenges that still need to be addressed. In general, improving instructors' skills, encouraging ethical consciousness, and guaranteeing infrastructure and regulations that support education are all necessary for the successful integration of AI.

Recommendations

Based on the study's findings, educational stakeholders are urged to incorporate AI into the AI-TPACK framework in pre-arranged and context-sensitive manner. Complete professional development programs needed to raise teachers' AI literacy. Courses focus on technical skills, instructional applications, and critical assessment of material produced by AI. Teacher education programs needed to be modified to incorporate AI-TPACK competencies so that before-service and during-service instructors are equipped to successfully integrate AI into subject-specific teaching. To enable responsible AI use in classrooms and educational institutes to set clear ethical norms addressing concerns like algorithmic unfairness, data privacy, and academic integrity. To lessen inequalities in the placement of AI, schools make dependable skill organization and institutional support accessible. Promoting a balanced instructional approach that teachers use AI tools to enhance rather than replace students' critical thinking abilities and teachers' professional judgement is also crucial. In order to assess the effects of AI integration and create contextually suitable plans especially for educational situations with limited resources continuous research and monitoring systems be promoted.

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