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Exploring the Use of Artificial Intelligence Tools for Teachers' Pedagogical Skill Enhancement at the Secondary Level

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Abstract

This study investigates the use of artificial intelligence (AI) tools for improving teachers' pedagogical skills at the secondary level. The purpose of the study was to examine how AI-driven applications become increasingly integrated into education, offering new opportunities for improving lesson planning, assessment practices, differentiated instruction, and classroom management. The study's objectives were to identify the level of awareness and understanding of AI tools and to determine the extent to which teachers utilise AI tools for pedagogical enhancement at the secondary level. In order to achieve the objectives, research questions were used to check the association between the use of artificial intelligence (AI) tools for enhancing teachers' pedagogical skills at the secondary level. The population includes female school teachers from the district of Mardan. The study sample consists of 320 female (primary, middle and secondary) school teachers, who were selected randomly. For the conduction of the study, a positivist research paradigm was used, and the research design was descriptive. A closed-ended questionnaire with a five-point Likert scale was used for data collection. The data was analysed to identify the level of awareness and understanding of AI tools, and to what extent teachers utilise AI tools for pedagogical enhancement. Data was scrutinised using SPSS: descriptive statistics (mean, standard deviation, frequency, and percentage) and inferential statistics ($p<0.05$) to determine the significance of AI use and pedagogical skills. The study findings underlined the need for professional training, Government support, and policy guidelines to ensure accountable AI integration in pedagogy.

Key Words

Artificial Intelligence, Pedagogical Skills, Teachers

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Introduction

In the 21st century, Artificial Intelligence (AI) arose as one of the most groundbreaking skills in various fields, including education. Its combination with teaching and learning techniques has changed the way teachers create lessons, evaluate student achievement, and help in professional growth. In secondary education, where teachers nurture critical thinking, problem-solving, and analytical skills in students, and to improve teaching abilities, AI tools help a lot in teaching.

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Teachers may modify learning experiences and make data-driven decisions with the use of AI-powered tools for educational applications like intelligent tutoring systems, adaptive learning plans, virtual aides, and automatic feedback tools.

Artificial Intelligence (AI) has meaningfully transformed various areas, especially in education. Digital tools are used in pedagogy to enhance instruction, assessment, and student engagement in classrooms, which evolve around dynamic, technology-driven environments. Teachers are increasingly expected to integrate them. Artificial Intelligence tools that are intelligent tutoring systems, automated assessment applications, personalised learning platforms, and language-processing systems are initially powerful resources for improving teachers' pedagogical skills. These tools not only help educators in lesson planning, content formation, and concurrent feedback but also are used to improve instructional quality by empowering data-informed decision-making (Holmes et al., 2019).

AI helps teachers by automating routine tasks like generating quizzes, evaluating student performance, and finding learning gaps. It helps teachers to spend more time on higher-order instructional practices, like critical thinking, mentorship, and modified learning actions (Luckin et al., 2016). Tools like Chat-GPT, flexible learning systems, and AI-enabled Learning Management Systems (LMS) offer teachers opportunities to create activities, adapt instructional resources, and mould content to students' cognitive levels. By using these applications, teachers boost students' pedagogical capabilities, as well as lesson variation, formative assessment abilities, content handover methods, and classroom supervision approaches (Tanvir et al., 2024).

Purpose of the Study

Artificial Intelligence tools were used to enhance teachers' pedagogical skills at different levels. It seeks to understand teachers' views, experiences, and challenges regarding the integration of AI in classroom practices and professional development.

Research Objectives

1. To find the level of awareness and understanding of AI tools among teachers.
2. To determine the level to which teachers utilise AI tools for pedagogical enhancement.

Research Questions

1. What is the level of awareness and understanding of AI tools among school teachers?
2. To what extent are AI tools being used to increase teachers' pedagogical skills?

Review of Related Literature

Artificial Intelligence In Education

AI improves instructional decision-making, streamlines administrative processes, and facilitates personalised learning. AI gives educators analytical insights into how pupils learn and enables tailored training. The usage of algorithms and device learning systems that imitate human intelligence to enhance teaching and learning is known as artificial intelligence in education (AIED) (Holmes et al., 2019).

AI has drastically changed education over the past ten years by providing intelligent tutoring programs, automatic feedback, modified learning, and predictive analytics. The application of intelligent systems like device learning, natural language handling, and generative AI to improve instruction, learning, assessment, and educational administration is known as artificial intelligence in education or AIED. Researchers stress that, when applied appropriately, AI has the ability to enhance student outcomes, assist educators, and advance equitable learning (Holmes et al., 2019).

AI tools' use is not without its complications, despite these advantages. Teachers frequently deal with problems such as inadequate digital infrastructure, a lack of training, ethical dilemmas, data confidentiality concerns, and a lack of enthusiasm for technological change. The successful incorporation of AI into pedagogy entails capacity-building initiatives, organised support, and policies that ensure responsible and unbiased use of technology in classrooms. The prospect of AI enhancing teachers' instructional skills remains significant, and it is a vital area of exploration for modern educational research (OECD, 2020).

Intelligent Tutoring Systems (ITS)

Studies showed that well-made ITSs can produce learning gains comparable to one-on-one human instruction. Intelligent Tutoring Systems are among the first and best investigated AIED applications. ITSs provide step-by-step directions, real-time response, and learning pathway customisation based on student presentation (VanLehn, 2011). In subjects like science, math, and language acquisition, modern ITSs have been successful by using machine-learning algorithms (Graesser et al., 2023).

Adaptive and Personalised Learning Systems

In online knowledge and higher education, personalised learning settings have become increasingly widespread. AI is used in teaching learning platforms to decide students' learning, strengths, aptitude and shortcomings. These systems then deliver personalised content and pace. It has been revealed that adaptive systems greatly raise academic success, especially for underachieving learners (Kulik & Fletcher, 2016).

AI for Assessment and Feedback

AI tools are capable of evaluating assignments, generating tests, finding plagiarism, and giving instant feedback. NLP-based tools and automated essay rating classifications have been established as reliable as human graders. The use of generative AI for making practice questions, precising content, and giving formative feedback is growing (Shermis & Burstein, 2002).

AI and Teachers' Pedagogical Skills

It represents teachers' capabilities in planning lessons, supervising classrooms, using instructional approaches, and evaluating students' learning effects (Shulman, 1987). Luckin et al. (2016) and Chen et al. (2021) revealed that AI tools can increase teachers' capability to personalise instruction, deliver timely feedback, and improve more attractive learning atmospheres.

Artificial Intelligence (AI) is gradually being integrated into classroom teaching, valuation, and educational administration. Teachers' pedagogical skills, planning, instruction, differentiation, assessment, and classroom management are undergoing change due to the use of AI tools leading the way in teaching. Researchers' studies showed that AI can enhance and elongate teachers' pedagogical capabilities, but it cannot change the professional decision, emotional intelligence, and contextual thoughtfulness of teachers (Holmes & Tuomi, 2022).

AI as a Support Tool for Pedagogical Planning

AI increased teachers' lesson preparation way and instructional strategies by constructing content, learning objectives, and differentiated resources. AI-driven tool helps teachers in evaluating curriculum standards, modifying lesson plans and creating events associated with learners' needs. Studies showed that AI-powered tools reduce teachers' workload and increase planning effectiveness. Creative AI tools such as Chat-GPT can propose teaching tactics, improve questionnaires, and deliver innovative ideas for tutoring (Luckin et al., 2016).

The addition of electronic learning into educational observes also aligns with the global shift toward Education 4.0, which highlights improvement, digital literacy, modified learning, and competency-based methods. Learning institutes gradually adopt blended and hybrid learning techniques, and AI becomes more central in serving trainers to traverse complex classroom dynamics and different pupil requirements. AI-driven analytics helps tutors in assessing student improvement, calculating performance leanings, and classifying students, enabling timely involvements that enhance overall academic success (UNESCO, 2021).

AI and Assessment Literacy

One essential instructional ability is valuation literacy. AI aids by forming tests and learning responsibilities, automating the grading of objective analyses, proposing formative comments, and examining undergraduate replies to identify misconceptions. Teachers' valuation accuracy and suitability are amended via learning analytics dashboards and automated essay scoring (AES) technologies. AI helps instructors monitor student achievement and adjust their lesson plans (Shermis & Burstein, 2002).

AI and Teachers Professional Development

AI-driven opinions on instructional videos, micro learning elements, virtual coaching, and mockups are all provided via AI-based professional development (AI-PD) platforms. Investigation has verified that AI-supported professional development develops trainers' material proficiency, tech integration abilities, and philosophical training (Zawacki-Richter et al., 2019). Additionally, AI tools improve professional development by contributing to ongoing knowledge. Instructors can get immediate concepts for classroom activities, resource recommendations, explanations of difficult concepts, and teaching tactics.

Trainers who work in settings with low incomes and few opportunities for customary professional development assistance greatly benefit from this kind of support, which increases their self-efficacy and self-reliance. Furthermore, by providing insights into student learning designs and endorsing appropriate pedagogical involvement, AI systems maintain reflective instructional techniques (Zawacki et al., 2019).

Theoretical Framework

The study was conducted by two interconnected models:

a) Technological Pedagogical Content Knowledge (TPACK) Model

The convergence of technology, pedagogy, and content knowledge is emphasised by the TPACK context. It indicates that when instructors realise how these three areas interact, they may use technology to explain successfully. This framework is enhanced by AI tools, which give mentors new ways to present measurable and assess student learning.

Figure 1

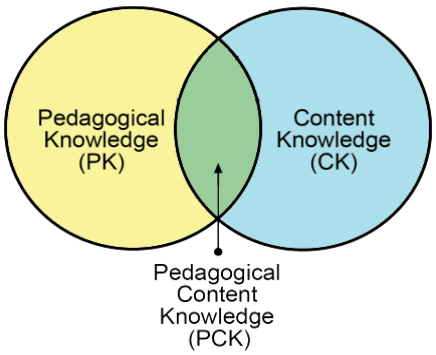
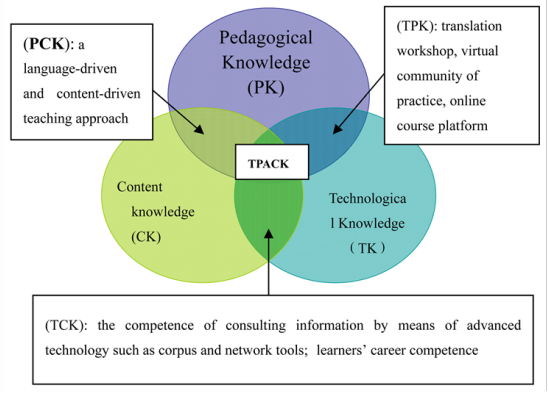


Figure 2



b) Diffusion of Innovation Theory (Rogers, 2003)

This theory defines the parts of the implementation of new technology, such as artificial intelligence (AI): knowledge, encouragement, decision, implementation, and validation. It assists in realising the approaches and implementation patterns of mentors towards AI in the classroom. Everett Rogers' Diffusion of Innovation (DOI) theory (2003) tells how new concepts, products, or practices (innovations) spread through a population over time. The process is influenced by four key features: improvement itself, communication channels, time, and a social system.

Conceptual Framework

This framework marks the following expectations:

- Self-sufficient Use of AI technologies (awareness, access, training, utilisation) is a variable.
- Trainers' pedagogical capabilities (lesson planning, teaching strategies, evaluation methods) are the dependent variable.
- Moderating Variables: Institutional support, teacher attitude, and technological infrastructure.
- When supported by formal policies and professional development initiatives, the practice of AI is believed to encourage outcomes in teachers' pedagogical proficiencies.

Research Methodology

Research Design

This study was a quantitative, descriptive survey design to gather information on teachers' use of AI tools and their impact on pedagogical skills.

Population and Sample

The target population includes primary, middle and high school teachers in district Mardan, Khyber Pakhtunkhwa. A sample of 320 teachers was selected using random sampling to ensure representation across schools.

Research Instrumentation

A structured questionnaire was developed containing sections on awareness and usage of AI tools, perceived impact on pedagogical skills, and challenges in AI adoption. Items were rated by using a 5-point Likert scale (1 = Strongly Agree to Strongly Disagree =5).

Validity and Reliability

Content validity was recognised through skilled review. Pilot test data were collected from 30 teachers. Cronbach's Alpha was used to assess reliability (acceptable $\alpha \geq 0.70$).

Data Collection

Data was collected via both online and paper-based questionnaires. Consent and confidentiality were ensured.

Data Analysis

Data was examined by means of SPSS: descriptive statistics (mean, frequency, and percentage) and inferential statistics ($p<0.05$) to determine the significance of AI use and pedagogical skills.

Ethical Considerations

Informed consent was obtained, and privacy was maintained. The research study complied with institutional ethical research guidelines.

Result and Discussion

Table 1

Exploring the Use of Artificial Intelligence Implementations for Teachers' Pedagogical Skill Enhancement.

Teachers Responses	Percentages					χ^2	df	P-value
	SA	A	UD	D	SD			
Role of Artificial Intelligence in Teaching	129 (40%)	150 (47%)	22 (7%)	14 (4%)	5 (2%)	12.984	4	P<0.05
Artificial Intelligence helps in Intelligent Tutoring Systems (ITS)	160 (50%)	126 (39%)	31 (10%)	0 (0%)	3 (1%)	5.973	3	P>0.05
Artificial Intelligence is adaptive and Personalised Learning Systems in education	125 (39%)	136 (43%)	11 (3%)	18 (6%)	30 (9%)	12.392	4	P<0.05
AI is used for Assessment and Feedback in education	174 (54%)	113 (34%)	9 (4%)	16 (5%)	8 (3%)	22.927	4	P<0.05
AI helps in teachers' pedagogical skills	116 (36%)	187 (59%)	6 (2%)	7 (2%)	4 (1%)	19.917	4	P < 0.05
AI as a Support Tool for Pedagogical Planning in Education	178 (56%)	116 (36%)	9 (3%)	9 (3%)	8 (2%)	13.372	4	P <0.05
AI helps in assessing Literacy in education	148 (46%)	119 (37%)	3 (1%)	23 (7%)	27 (8%)	28.918	4	P <0.05
AI helps in teachers' Professional Development	129 (40%)	175 (55%)	6 (2%)	0 (0%)	10 (3%)	10.252	4	P <0.05

The above table shows the role of artificial intelligence in teaching. In this regard, the question was asked of the primary, middle and high school teachers regarding the statement. 40% of teachers opted for strongly agree, 47% opted for agree, 22% opted for undecided, 14% opted for disagree, and 5% opted for strongly disagree. The chi-square test value was 12.984 and greater than the tab value 9.488 at 0.05. Results showed the role of artificial intelligence in education is significant. These results support the earlier findings of Holmes and Tuomi (2022) and Holmes et al. (2019).

The table shows that Artificial intelligence helps in intelligent tutoring systems (ITS). In this regard, the question was asked from the primary, middle and high school teachers regarding how artificial intelligence helps in an intelligent tutoring system. 50% of teachers opted for strongly agree, 39% opted for agree, 10% opted for undecided, 0% opted for disagree, and 1% opted for strongly disagree. The chi-square test value was 5.973 and less than the tab value of 9.488 at 0.05. Results showed that artificial intelligence's help in intelligent tutoring systems is insignificant. These results contrast with the earlier findings of (Graesser et al., 2023; VanLehn, 2011).

The above table shows that artificial intelligence is adaptive and personalised learning systems in education. In this regard, the question was asked from the primary, middle and high school teachers regarding whether artificial intelligence is adaptive and personalised learning systems in education. 39% of teachers opted for strongly agree, 43% chose to agree, 3% picked undecided, 6% decided for disagree, and 9% strongly disagreed. The chi-square test value was 12.392 and greater than the tab value 9.488 at 0.05. Results showed that artificial intelligence is adaptive and personalised learning systems in education are significant. These results support the earlier findings of Kulik and Fletcher (2016).

AI is used for assessment and feedback in education. In this regard, the question was asked from the primary, middle and high school teachers regarding whether AI is used for assessment and feedback in education. 54% of teachers opted for strongly agree, 34% opted for agree, 4% opted for undecided, 5% opted for disagree, and 3% opted for strongly disagree. The chi-square test value was 22.927 and greater than the tab value 9.488 at 0.05. Results showed that AI is used for assessment and feedback in education, which is significant, according to Studies by Luckin et al. (2016).

AI helps in teachers' pedagogical skills. In this regard, the question was asked from the primary, middle and high school teachers regarding how AI helps in teachers' pedagogical skills. 36% of teachers opted for strongly agree, 59% opted for agree, 2% opted for undecided, 2% opted for disagree, and 1% opted for strongly disagree. The chi-square test value was 19.917 and greater than the tab value of 9.488 at 0.05. Results showed that AI helps in teachers' pedagogical skills is significant. These results support the earlier findings of (Shulman, 1987; Chen et al., 2021).

The table shows AI as a support tool for pedagogical planning in education. In this regard, the question was asked from the primary, middle and high school teachers regarding AI as a support tool for pedagogical planning in education. 56% of teachers opted for strongly agree, 36% opted for agree, 3% opted for undecided, 3% opted for disagree, and 2% opted for strongly disagree. The chi-square test value was 13.372 and greater than the tab value 9.488 at 0.05. Results showed that AI as a support tool for pedagogical planning in education is significant. These results support the earlier findings of Holmes et al. (2022).

AI helps in assessment literacy in education. A question was asked of the primary, middle and high school teachers regarding how AI helps in assessment literacy in education. 46% of teachers selected for strongly agree, 37% elected for agree, 1% opted for undecided, 7% opted for disagree, and 8% decided for strongly disagree. The chi-square test value was 28.918 and greater than the tab value 9.488 at 0.05. Results showed that AI helps in assessment literacy in education is significant. These results support the earlier findings of (Luckin et al., 2016; Shermis & Burstein, 2002).

The above table shows that AI helps in teachers' professional development. The question was asked from the primary, middle and high school teachers regarding how AI helps in teachers' professional development 40% of teachers opted for strongly agree, 55% opted for agree, 2% opted for undecided, 0% opted for disagree, and 3% opted for strongly disagree. The chi-square test value was 10.252 and greater than the tab value of 9.488 at 0.05. Results showed that AI helps in teachers' professional development is significant. These results support the earlier findings of (Zawacki-Richter et al., 2019).

Recommendations

The results informed educational policymakers about effective ways to integrate AI into teacher professional development. This study is significant for curriculum developers, teachers, students and other researchers.

References

Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, *8*, 75264-75278. https://doi.org/10.1109/ACCESS.2020.2988510

Graesser, A. C., Hu, X., Nye, B. D., & Sottilare, R. (2023). *Advances in Intelligent Tutoring Systems*. Springer.

Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. *European journal of education*, *57*(4), 542-570. https://doi.org/10.1111/ejed.12533

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education promises and implications for teaching and learning*. Center for Curriculum Redesign.

Kulik, J. A., & Fletcher, J. D. (2016). Effectiveness of intelligent tutoring systems: a meta-analytic review. *Review of educational research*, *86*(1), 42-78. https://doi.org/10.3102/0034654315581420

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. (2016). *Intelligence Unleashed: An Argument for AI in Education*. Pearson.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers college record*, *108*(6), 1017-1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

OECD. (2020). *Digital Education Outlook 2021: Teaching in the Digital Age*. OECD Publishing.

Rogers, E. M. (2003). *Diffusion of Innovations* (5th ed.). Free Press.

Shermis, M. D., & Burstein, J. (2002). *Automated essay scoring: A cross-disciplinary perspective* (M. D. Shermis & J. C. Burstein, Eds.). https://doi.org/10.4324/9781410606860

Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard educational review*, *57*(1), 1-23. http://dx.doi.org/10.17763/haer.57.1.j463w79r56455411

Tanvir, A., Bashir, S., & Shahzadi, S. (2024). Exploring the role of Artificial Intelligence in enhancing teachers' competencies: A comprehensive review. *Global Social Sciences Review*, *IX*(IV), 115–123. https://doi.org/10.31703/gssr.2024(ix-iv).12

UNESCO. (2021). *AI and Education: Guidance for Policy-makers*. UNESCO.

UNESCO. (2022). *Artificial Intelligence and Learning: Guidance for Policymakers*. Paris: UNESCO.

VanLEHN, K. (2011). The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. *Educational Psychologist*, *46*(4), 197-221. https://doi.org/10.1080/00461520.2011.611369

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education*, *16*(1). https://doi.org/10.1186/s41239-019-0171-0