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Integrating Human Pedagogy and Artificial Intelligence in Teaching Practices

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Abstract

Introduction: The rapid development of artificial intelligence (AI) in education has brought both benefits and challenges, but still there is a limited research done on how AI can be integrated with human pedagogy. This study aims to explore how Integrating human pedagogy and AI can improve teaching practices without affecting teacher-student interaction.

Materials and Methods: This study used descriptive mixed-methods methodology. 100 teachers from ten government schools in Karak, Pakistan, were taken as a sample. They filled a validated questionnaire containing both open-ended and Likert-scale items. Quantitative data were analyzed using descriptive and inferential statistics, while qualitative responses were examined through thematic analysis to ensure validity and reliability.

Results: Most teachers reported using ChatGPT to plan and organize lessons and they believed that AI improved student engagement, assessment, and personalized learning. However, there is a fear of major challenges including lack of training, limited access to technology, and privacy concerns. Secondary school teachers reported greater benefits from AI than those of primary teachers.

Conclusion: These findings shows that with clear policy, teacher training, and equal access to digital resources, integrating AI with human pedagogy can create more personalized, creative, and inclusive learning environments in Pakistan.

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Introduction

In recent years, the use of artificial intelligence (AI) in education is growing worldwide. AI tools are now used as part of everyday life, and education is no exception (Zawacki-Richter et al., 2019). Both teachers and students are using AI tools increasingly to improve lessons, decrease workloads, and even get help in research and planning activities (Mollick & Mollick, 2022; Walton Family Foundation, 2023). As technology is increasingly taking part in our life, it is obvious that AI will be part of people's education, their careers and future working environments, making it important for learners and teachers to learn how to use AI tools effectively and become literate in its uses and capabilities (Prothero, 2023). That's why, many researchers believe that education must not ignore AI but instead they should learn how to use it responsibly for the benefit of all learners (Sharma & Kumar, 2023).

The integration of pedagogy in AI-enhanced education shows both advantages and challenges, on one hand, AI technologies can bring new tools and methods that can make teaching more effective and interesting, help in personalized learning, and help with other works while on the other hand, there are fears of how AI might affect traditional teaching and learning methods, student-teacher interaction, and even the psychological health of learners and educators (Obidovna, 2024). While some fear that AI might weaken human elements in education as it lacks emotion, body language which is important in teaching, others argue that it should be seen as a partner in the process. The idea of using AI as a tool, not a replacement, for improving the pedagogical process of everyone in education has even been described as a desirable slogan, suggests that AI can help in better teaching if applied wisely (Nemorin et al., 2022).

One of AI's greatest advantages is adaptive and personalized learning, where technology adjusts materials according to the needs of each individual (Chen et al., 2020). Despite treating all students the same, personalized systems allow learners to progress at their own pace and get feedback according to their weaknesses and strengths. AI is not only a helping tool for activities such as grading or organizing lessons, it has developed into a type of co-instructor that can help in personalizing learning, solving difficulties, and can even provide real-time feedback to improve student progress (Luckin, 2018). This shows that how AI can move beyond administration and support the learning process in classrooms.

Despite these advantages, the increasing growth of AI in education has also raised important discussion, questions were raised about teacher autonomy, student engagement, and ethics have become more urgent as algorithmic decision-making influences (Zawacki-Richter et al., 2019). Ethical concerns include the risks of bias in AI systems, problems with technology availability and the fear that technology could reduce meaningful human interactions in classrooms. These fears show that while AI can improve education, it must be integrated carefully to ensure that institutions remain student-centered and fair for all learners (Qureshi, 2025).

For this reason, including AI in education requires more than just adding new tools. Teachers should be trained in digital literacy and must also have knowledge about the ethical issues related to AI and upskilling educators should ensures that they are not just users of technology but informed guides who can integrate AI in ways that support learning (Zawacki-Richter et al., 2019). Instead of seeing AI as a threat, teachers can use its capabilities to enhance teaching outcomes, manage administrative work, and can create more time for real human interaction with students (Molnar et al., 2021). This approach aligns with the idea of collaborative human-AI pedagogy, where technology and educators work together to create stronger and more suitable learning environments (Qureshi, 2025).

In Pakistan, the use of artificial intelligence (AI) in education presents both significant opportunities and notable challenges. Ethical issues such as data privacy, algorithmic bias, and the digital divide are critical to ensuring fair access and equal opportunities for all students (Selwyn, 2019). Protecting student information and reducing biases in AI systems are essential to creating an inclusive learning environment that benefits everyone. Moreover, as Pakistani educational institutions increasingly integrate AI technologies, it becomes vital to balance innovation with ethical responsibility. While AI can improve teaching quality and student engagement, it also requires

careful planning to avoid risks like excessive dependence on technology or unequal access to AI-based tools. Therefore, implementing AI in education should be guided by a critical approach that emphasizes equity and student well-being (Ullah et al., 2024).

Significance of the Study

The significance of this study lies in its focus on how teachers in primary and secondary schools of Karak perceive and use artificial intelligence (AI) in education, as well as the benefits and challenges they are facing. By identifying these factors, the research provides valuable insights for policymakers, school leaders, and teacher training institutions about the required support for the responsible integration of AI in education. Moreover, the results can help educators to use AI in order to enhance, rather than replace, human pedagogy, leading to more fair, effective, and sustainable teaching and learning practices in Pakistan.

Problem Statement

Although Artificial intelligence (AI) has the capability to improve teaching and learning in Pakistan, its use in primary and secondary schools, especially in Karak, is still very limited and not well understood. Teachers face challenges such as lack of training, poor access to technology, and little awareness of ethical issues. Because of these issues, it is not clear how AI can be used together with human teaching without decreasing teacher control, relationship with student, or fairness in education.

Research Questions

1) How aware are teachers of AI, and how do they use it in their teaching?
2) What benefits and challenges do teachers face when using AI in classrooms?

Research Objectives

1) To explore how teachers use artificial intelligence (AI) in their teaching practices.
2) To identify the benefits and challenges teachers face when using AI in classrooms.

Materials and Methods

This study employed a cross-sectional descriptive design to explore the integration of human pedagogy and artificial intelligence (AI) in teaching practices. A mixed-methods approach was adopted, combining survey-based quantitative data with qualitative insights from open-ended responses. This design allowed for both the measurement of trends and the deeper exploration of teachers' perspectives.

The study was conducted in 10 government schools in Karak, Pakistan, between March and May 2025. A total of 100 teachers, 10 from each school, were recruited using purposive sampling. Teachers from both primary and secondary levels were included in order to ensure representation across teaching stages. Eligible participants were those currently engaged in classroom teaching with at least one year of experience and who consented to participate voluntarily. Teachers on extended leave, those in purely administrative roles, or those unwilling to participate were excluded.

The required sample size was calculated using the single population proportion formula:

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{d^2}$$

Where n is the required sample size, Z is the Z-value at a 95% confidence level (1.96), p is the estimated proportion of teachers familiar with AI (assumed to be 0.5 in the absence of prior data, which maximizes sample size), and d is the margin of error (set at 0.10). Substituting these values:

$$n = \frac{(1.96)^2 \; x \; 0.5 \; x \; (1-0.5)}{(0.10)^2}$$

$$n = \frac{3.8416 \; x \; 0.25}{0.01}$$

$$n = \frac{0.9604}{0.01}$$

$$n = \; 96.04$$

Thus, a final sample size of 100 teachers was considered sufficient for the study.

Data were collected through a structured, self-administered questionnaire that was developed after reviewing the relevant literature. The instrument consisted of five sections: demographic details, awareness and use of AI, perceived benefits of AI in teaching, challenges and limitations of AI use, and open-ended items for qualitative insights. The questionnaire included both Likert-scale items, rated on a five-point scale (1 = strongly disagree, 5 = strongly agree), and open-ended questions. A pilot test was conducted

with 10 teachers outside the study sample to ensure clarity and feasibility, and necessary modifications were made before the final administration.

Content validity was established through expert review by three educationists and two specialists in AI, who confirmed the relevance and clarity of the items. Reliability was assessed using Cronbach's alpha, and a score of 0.7 or above was considered acceptable for internal consistency. The pilot test confirmed that the instrument met this threshold, and the revised questionnaire was subsequently used for data collection.

Permission to conduct the study was obtained from the District Education Department and from the principals of the participating schools. Teachers were informed about the objectives of the research, the voluntary nature of their participation, and the assurance of confidentiality and anonymity. Questionnaires were distributed during staff meetings and collected within one week. Informed consent was obtained from all participants, and their anonymity was preserved to reduce social desirability bias and encourage honest responses. Quantitative data were entered and analyzed using SPSS version 26. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the data. Inferential statistics, such as independent sample t-tests and chi-square tests, were applied to compare responses across groups (e.g., primary versus secondary teachers, male versus female teachers), with a significance threshold set at p < 0.05. Qualitative responses from open-ended items were subjected to thematic content analysis. Two researchers independently coded the responses to identify recurring themes and subthemes, and discrepancies were resolved through discussion to minimize researcher bias.

Bias reduction was carefully considered throughout the study. Selection bias was minimized by including teachers from multiple schools and across teaching levels. Response bias was addressed by assuring participants that their responses would remain anonymous and would not affect their professional status. Researcher bias was reduced through independent coding of qualitative data by two analysts. These strategies ensured that the study maintained methodological rigor and produced findings that were both reliable and credible.

Results

The demographic characteristics of the participating teachers are presented in Table 1. Out of 100 teachers, 55 participants were male (55%) and 45 participants were female (45%). The majority of teachers (38%) were between 30–39 years of age, followed by 25% in the 40–49 group. Nearly half of the participants (52%) taught at the secondary level, while 48% taught at the primary level. Teaching experience was relatively well distributed, with 32% having 5–10 years of experience, 28% with 11–15 years, and 22% with more than 15 years, whereas only 18% had less than five years of experience. This diversity provided a balanced perspective across age, teaching level, and professional experience.

Table 1. Demographic characteristics of participating teachers (n = 100)

Variable	Categories	Frequency (n)	Percentage (%)
Gender	Male	55	55.0
	Female	45	45.0
Age (years)	<30	20	20.0
	30–39	38	38.0
	40–49	25	25.0
	≥50	17	17.0
Teaching Level	Primary	48	48.0
	Secondary	52	52.0
Teaching Experience	<5 years	18	18.0
	5–10 years	32	32.0
	11–15 years	28	28.0
	>15 years	22	22.0

Teachers' awareness and use of AI in teaching are shown in Table 2. Most participants reported being moderately to highly familiar with the concept of AI (mean = 3.9 ± 0.8). However, fewer had received formal training on AI tools (mean = 2.8 ± 1.0).

Despite this, many teachers reported active use of AI-based tools in their classrooms (mean = 3.2 ± 0.9), suggesting that practical engagement is occurring even in the absence of structured training.

Table 2. Teachers' awareness and use of AI in teaching (Likert-scale mean scores)

Item	Mean ± SD
Familiar with the concept of Artificial Intelligence (AI)	3.9 ± 0.8
Received training on AI tools in teaching	2.8 ± 1.0
Currently use AI-based tools (e.g., smart boards, adaptive apps)	3.2 ± 0.9

Teachers reported using AI for a variety of instructional purposes, as summarized in Table 3. The most frequent purpose was developing simplified teaching techniques to present topics (55%), followed by translation into Urdu or English (48%) and lesson planning (46%). Around 42% used AI to generate SLO-based questions, while

39% employed it for formative assessments. Relatively fewer teachers reported using AI for administrative tasks (28%) or real-time feedback (31%). These findings highlight that AI is predominantly used to support core teaching tasks rather than peripheral duties.
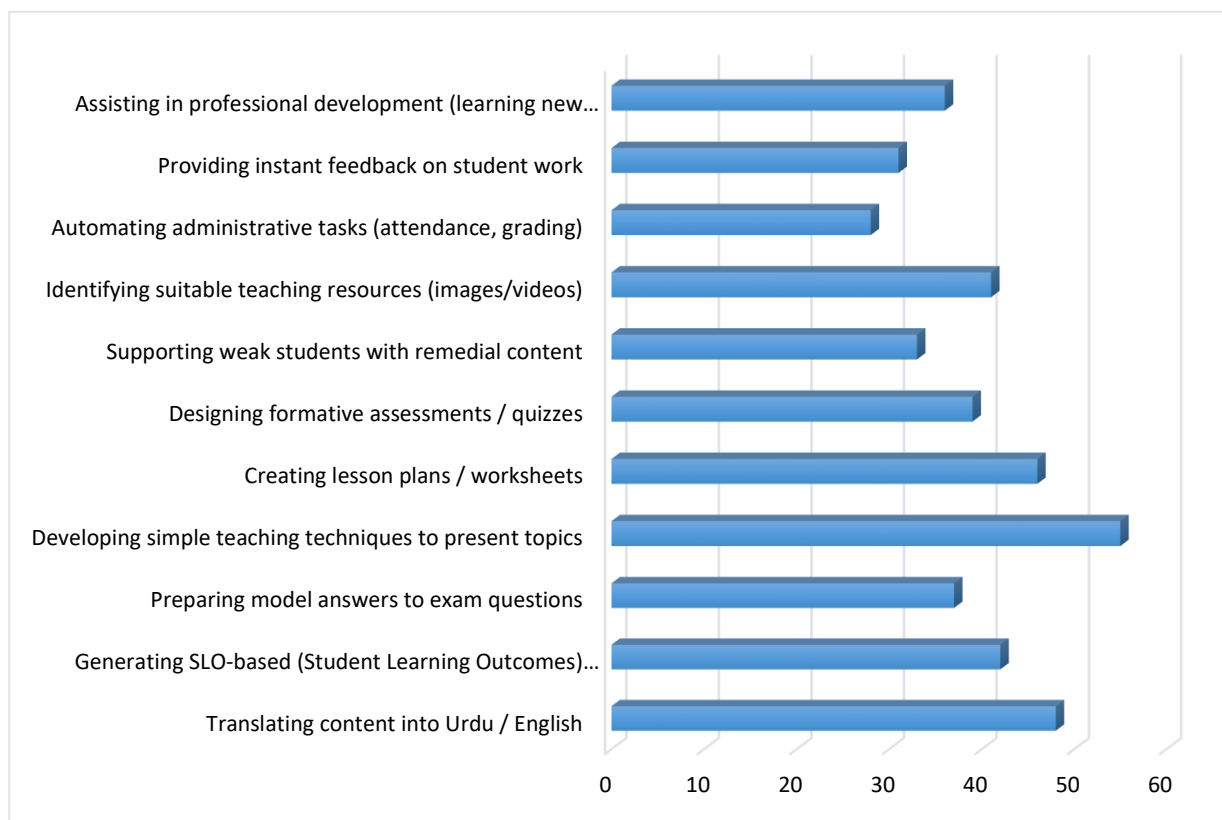

Figure 1: Purposes for which teachers reported using AI tools (n = 100)

With respect to applications, almost all teachers reported using ChatGPT (93%), making it the dominant AI platform in the study (see Table Y). Other tools such as Google Gemini (21%), Meta AI (15%), and Bing AI (12%) were used by a minority,

while 19% reported using support tools like Grammarly or QuillBot. This result indicates that ChatGPT has become the default AI assistant among teachers in government schools of Karak, with others playing a supplementary role.
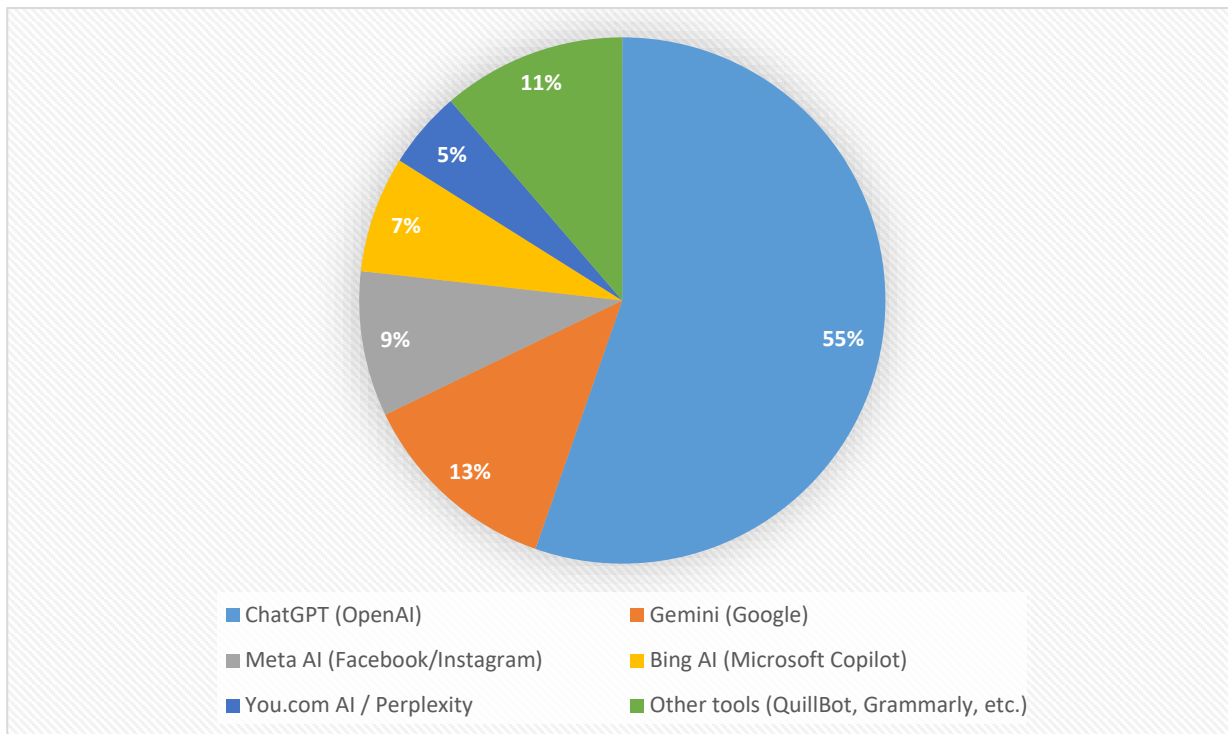
Figure 2: AI Applications Used by Teachers (n = 100)

Perceived benefits of AI integration are presented in Table 4. Teachers agreed that AI helps personalize student learning (mean = 4.0 ± 0.7), supports better assessment and feedback (3.9 ± 0.7), and enhances engagement (3.8 ± 0.9). Reduction of administrative workload was rated somewhat lower (3.6 ± 0.8), indicating that teachers primarily value AI for its instructional and learning benefits rather than its clerical functions.

Table 4: Perceived benefits of AI in teaching (Likert-scale mean scores)

Benefit Item	Mean ± SD
AI helps personalize learning for students	4.0 ± 0.7
AI reduces administrative workload (grading, attendance, reports)	3.6 ± 0.8
AI enhances student engagement in the classroom	3.8 ± 0.9
AI supports better assessment and timely feedback	3.9 ± 0.7

Perceived challenges are summarized in Table 5. Limited access to technology emerged as the strongest barrier (mean = 4.3 ± 0.7), followed by lack of training (4.1 ± 0.8). Teachers also raised concerns about over-reliance on AI affecting teacher–student relationships (3.9 ± 0.8) and issues of data privacy (3.7 ± 0.9). These findings underscore that structural and ethical challenges must be addressed for effective AI adoption.

Table 5: Perceived challenges in AI integration (Likert-scale mean scores)

Challenge Item	Mean ± SD
Lack of training is a barrier to using AI effectively	4.1 ± 0.8
Limited access to technology prevents AI integration	4.3 ± 0.7
Concerns about data privacy and ethical issues in AI use	3.7 ± 0.9
Over-reliance on AI may weaken teacher–student relationships	3.9 ± 0.8

A comparison of benefits between primary and secondary teachers is presented in Table 6. Statistically significant differences were observed in personalization of learning (p = 0.032), student engagement (p = 0.049), and assessment and feedback (p = 0.018), with secondary teachers reporting higher mean scores in each case. No significant difference was noted in reduction of

administrative workload (p = 0.417). This suggests that secondary teachers derive greater

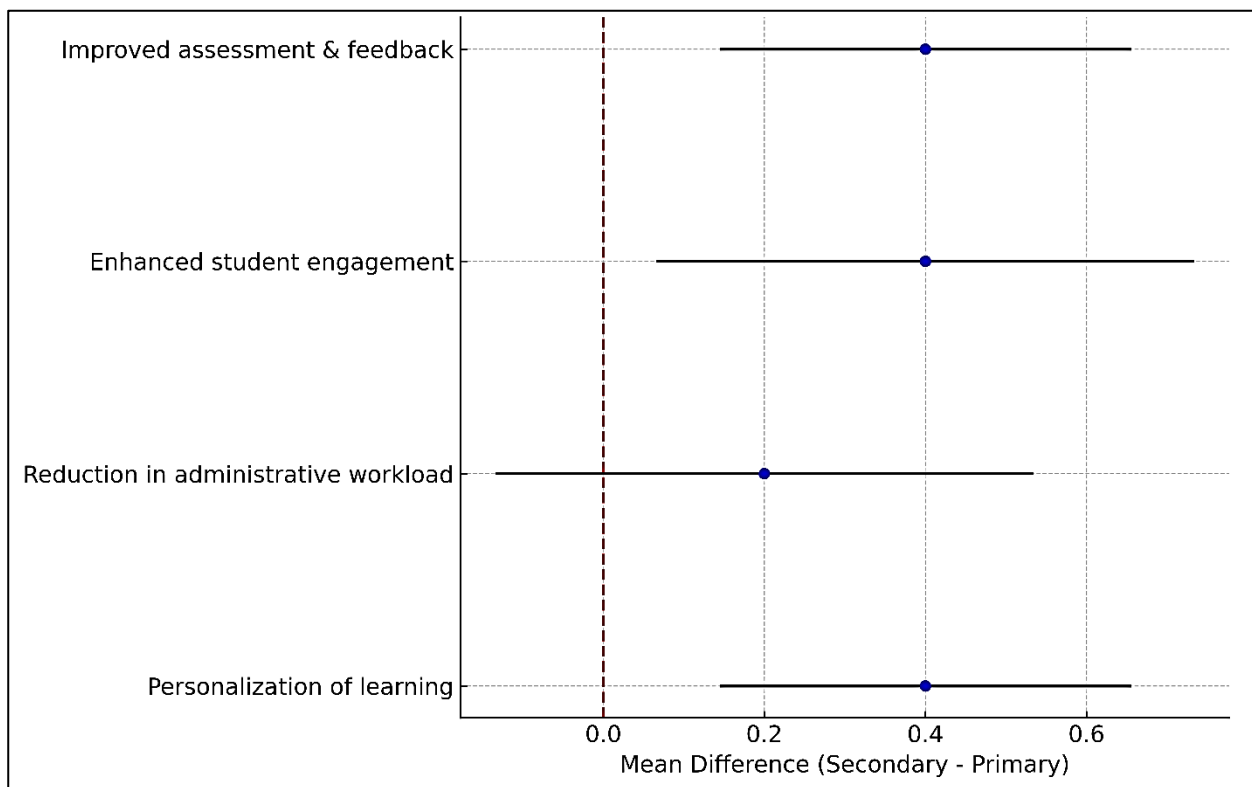instructional benefits from AI compared to their primary-level counterparts.

Figure 3: Comparison of benefits between primary and secondary teachers

Discussion

The findings of this study provide valuable insights into how teachers in government schools of Karak perceive and utilize artificial intelligence within their teaching practices, while also highlighting key challenges that shape adoption. The demographic diversity of participants, spanning gender, age, and teaching experience, ensured that perspectives were well balanced, reflecting broader trends in the teaching workforce.

One of the central findings was that teachers are moderately to highly familiar with AI (mean = 3.9 ± 0.8), yet formal training remains limited (mean = 2.8 ± 1.0). Despite this gap, teachers actively incorporate AI tools in their teaching (mean = 3.2 ± 0.9). This aligns with prior research (Holmes et al., 2022; Luckin, 2021), which noted that teachers often experiment with AI in classrooms even without structured training, driven by accessibility and student-centered benefits. However, the lack of training resonates with Alghamdi (2023), who emphasized that professional development remains the most critical factor for sustainable AI adoption.

In terms of applications, the dominance of ChatGPT (reported use by 93% of teachers) is striking. This figure is much higher than those reported in studies from Western contexts, where teacher reliance on AI platforms tends to be more distributed across multiple tools (Zawacki-Richter et al., 2019). The finding suggests that ChatGPT has become the "default" AI assistant in low-resource contexts due to its accessibility, adaptability to local needs (e.g., Urdu/English translation), and ability to handle multiple tasks. Interestingly, other platforms such as Google Gemini (21%), Meta AI (15%), and Bing AI (12%) played only a supplementary role. This concentration on a single platform raises questions about dependency, echoing concerns by Selwyn (2022) about the risks of monopolistic AI use in education.

Regarding instructional purposes, teachers most frequently used AI to simplify teaching techniques (55%), support translation (48%), and assist in lesson planning (46%). This aligns with studies in multilingual contexts (e.g., Khan et al., 2021), where translation functions are crucial for bridging linguistic gaps in education. Similarly, the use of AI for assessment (39%) and generating SLO-based questions (42%) is consistent with findings by

Chen et al. (2020), who argued that AI excels at automating repetitive assessment tasks. However, relatively fewer teachers employed AI for real-time feedback (31%) or administrative tasks (28%), suggesting that AI is perceived primarily as a teaching aid rather than a clerical support tool.

The perceived benefits further strengthen this observation: teachers rated personalization of learning (mean = 4.0 ± 0.7), assessment support (3.9 ± 0.7), and classroom engagement (3.8 ± 0.9) more highly than administrative workload reduction (3.6 ± 0.8). This finding resonates with Luckin et al. (2016), who emphasized that AI's greatest potential lies in augmenting pedagogy rather than replacing human teachers' relational roles. Importantly, statistically significant differences were found between primary and secondary teachers, with secondary teachers reporting higher benefits in personalization, engagement, and assessment (p < 0.05). This may reflect secondary teachers' greater need for differentiated instruction and data-driven assessment, as highlighted in previous work by Wang & Yu (2020).

On the other hand, challenges remain substantial. Limited access to technology (mean = 4.3 ± 0.7) and lack of training (4.1 ± 0.8) were the most prominent barriers, echoing findings from developing-country contexts (Qadir et al., 2022). Ethical concerns, including data privacy (3.7 ± 0.9) and the risk of weakening teacher–student relationships (3.9 ± 0.8), also emerged. This supports concerns raised in UNESCO's 2021 report, which cautioned that over-reliance on AI could undermine human-centered pedagogy if not carefully managed.

Overall, the results underscore a paradox: teachers clearly recognize the pedagogical value of AI, particularly in personalization and assessment, yet face systemic barriers such as insufficient training and limited infrastructure. Integrating AI into education, therefore, requires not only technological access but also investment in teacher capacity-building and policies that safeguard human-centered pedagogy.

Strengths and Limitations
One of the main strengths of this study is its mixed-methods methodology, in which quantitative data combined with qualitative insights to present an in-depth view of teachers' perceptions. The study ensured a broad sample that truly represented a variety of teaching experiences by including

teachers from both primary and secondary levels across multiple government schools in Karak. Findings of the study become more reliable by the use of validated tools and statistical data to show reliability. Moreover, by independent coding of qualitative responses, the study addressed researcher bias which strengthened the overall authenticity of the analysis.

Alongside these strengths, there are some limitations. First, the study was restricted to a single district, because of which the results may not be generalizable to other districts of Pakistan. Furthermore, although the study examined teachers' opinions and practices but did not measure student outcomes directly, which offer deeper understanding about the effectiveness of AI integration.

Future Perspective
Looking forward, education in Pakistan and anywhere else could be significantly changed by integrating artificial intelligence and human pedagogy into teaching practices. To fulfill this achievement, policymakers and administrators must give priority to the development of ethical guidelines for AI use in classrooms, teacher training and equal access to digital resources. Future researchers should emphasize maintaining the human characteristics like creativity, empathy, and cultural sensitivity, all of which are crucial for effective pedagogy not only focus on technological adoption. By establishing integrated models that allow AI to encourage rather than toreplace teachers, education systems can establish a more personalized, inclusive, and adoptive learning environment in future.

Conclusion
This study underlies that the inclusion of artificial intelligence into teaching practices can significantly increase teaching efficiency and personalization when it is kept balanced with the human-centered principles of pedagogy. Teachers in Karak showed awareness of AI's capability and informed active use of tools like ChatGPT, primarily for lesson planning, translation, and assessment support. While possible benefits were identified in terms of student engagement and personalized learning, challenges such as limited access to technology, lack of proper training and courses, and ethical concerns remain crucial. The findings emphasized that Ai is important when it's

used as a supportive tool by the teachers in their professional context, not as a substitute. With accurate guidelines, resources, and proper training, the integration of human pedagogy and AI can make way for a more inventive and fair educational system.

Authors' contributions

WJ and RN contributed equally to this study.

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