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Discovering Teachers' AI Application, Innovation, and Students' Behavioral Attitudes toward AI in Learning in Secondary Schools in Quetta

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ABSTRACT

Aim of the Study: The main objective of this study was to assess the level of teachers' AI application and innovation and students' attitudes towards AI in government secondary schools of Quetta, and to determine the relationship between them.

Methodology: The study was based on Davis's (1989) Technology Acceptance Model, Liu et al.'s (2024) Teacher Innovation Theory, and Bandura's (1986) Social Cognitive Theory, which provide a theoretical explanation of the relationship between teachers' AI application and students' attitudes. This quantitative study adopted a descriptive and correlational methodology. For this purpose, 368 teachers (128 males, 240 females) and 394 students (216 boys, 178 girls) were selected from 112 government schools of Quetta through stratified random sampling.

Findings: The study findings show that the overall mean for teachers' AI application and innovation was M = 2.44 (SD = 0.507), which fell between "uncertain" and "applicable". Only 1.1% of teachers demonstrated the ability to develop innovative AI-based teaching models. The overall mean of students' behavioral attitudes was M = 2.242 (SD = 0.549), with 65.6% agreeing with the behavioral statements; however, students remained relatively cautious about pursuing a career in AI. Furthermore, linear Regression proved that teachers' AI application and innovation explained 98.5% of the variation in students' behavioral attitudes ($R^2 = .985$, $\beta = .992$).

Conclusion: Overall, the study concludes that students' attitudes towards AI were positive; however, teachers' practical AI skills were extremely limited. Therefore, the establishment of AI clubs and career guidance programs at the school level, practical training programs for teachers and longitudinal studies are recommended.

Keywords: Teachers' AI Application, Innovation, Students' Behavioral Attitudes toward AI, Secondary Schools in Quetta

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1. INTRODUCTION

Recent years have seen significant changes in education and educational institutions, largely due to new technologies. Teaching and learning methods have evolved and will continue to change as a result of the internet's rapid evolution. As a result, new technologies change how educators and teachers engage with students, establishing new teaching strategies and reshaping conventional classrooms. To effectively fulfill daily tasks, organizations rely heavily on information and communication technologies (ICT). Thus, AI is an emerging technology gaining traction. With tools like AI chatbots, their use is becoming increasingly common in our daily lives (Farahani & Ghasmi, 2024; Priyadi et al., 2025).

The worldwide success of AI integration in education has motivated educational institutions, together with policymakers, to analyze its potential use across developing nations. The research shows that AI can overcome educational limitations in such areas by filling resource gaps (Hwang et al., 2020). AI-managed remote learning systems have been implemented in underprivileged areas to address teacher shortages and deliver high-quality education to students (Sharma & Rani, 2021). The smart classrooms have been developed with innovative technologies, improving classroom management and supporting both in-person and remote learning (Dimitriadou & Lanitis, 2023).

AI is in its infancy in Pakistan; it is already being applied sparingly. Problems include inadequate teacher preparation, a lack of technological infrastructure, and insufficiently supported educational policies, which have become significant barriers. For the most part, AI holds enormous promise for the educational sector, typically at the secondary level. To meet students' demands, AI permits the formation of a more approachable and appealing learning environment (Safdar & Fatima, 2026; Yasin & Safdar, 2025; Imran et al., 2025).

Although the global education sector recognizes the importance of AI, Pakistan’s schools have not entirely leveraged it. However, the adoption of AI-based educational tools remains inadequate in Balochistan, where public educational institutions have fewer opportunities to adopt AI technologies (Ullah et al., 2024), particularly those in underdeveloped and rural areas. Thus, educational barriers persist throughout Balochistan, which is the largest province of Pakistan by territorial extent. The province has one of Pakistan's lowest literacy rates, and many schools lack adequate facilities, including qualified teaching staff, infrastructure, and essential educational materials (Coşkun, 2023). Government reports indicate that social and economic obstacles prevent around 0.8 million children from attending school in Balochistan, as highlighted by Kakar and Bashir (2023). Thus, educational conditions in Balochistan are worsening due to an abundance of schools lacking basic facilities (Chachar et al., 2023).

However, another challenge is the readiness of teachers and students to integrate AI. In Balochistan, a large proportion of teachers have not been trained in AI-based teaching methods and are unfamiliar with integrating technology into classroom processes (Chachar et al., 2023). Teachers also resist adopting AI for fear of being replaced by AI-activated automation in classrooms (Aggarwal et al., 2025; Rehman & Sajjad, 2025a). Despite these challenges, the benefits of AI in education may not be overlooked. Understanding of AI and teachers' readiness to teach, alongside student perceptions, are critical aspects in Balochistan that still need further research.

The successful implementation of AI in education relies on teacher-student attitudes, the development of digital literacy, and the genuine acceptance of AI-based educational resources (Uygun, 2024). The limited technological awareness in Balochistan produces strong opposition among key stakeholders toward AI in education due to their misunderstandings and suspicions toward AI (Kakar & Bashir, 2023). The adoption of AI faces greater difficulties in Balochistan because many local communities have low awareness of the educational benefits of digital technologies and resist AI-based learning, particularly among female students (Khurshid et al., 2025; Rehman & Sajjad, 2025b). However, research on teachers' and students' perceptions of AI acceptance and their readiness to embrace it is necessary, as these statistics pose a major stumbling block to the integration of AI systems (Alam, 2021). For that reason, the current study

explores AI applications and innovations, as well as students' behavioral attitudes toward AI in learning, especially in secondary schools in Quetta, Balochistan.

1.1 Research Questions

1. What is the level of teachers' application and innovation with AI tools in Quetta?
2. What are students' behavioral attitudes toward using AI in learning?
3. To what extent do teachers' AI applications and innovations predict students' behavioral attitudes?

1.2 Research Hypothesis

Research Hypothesis: Teachers' application and innovation with AI tools in education have a significant impact on students' behavioral attitudes (willingness to adopt/use AI in learning).

2. LITERATURE REVIEW

AI is transforming education and may be defined as the ability of machines to acquire knowledge and make decisions using algorithms (Ertel, 2025). From an educational perspective, AI is the branch of computer science that can perform functions such as reasoning, decision-making, and learning, which are conventionally associated with human intelligence (Abulibdeh et al., 2024). The growing use of data and machine learning technologies, alongside natural language processing and generative models, as teaching assistants in both formal and informal educational settings is commonly referred to as AI in Education (AIEd), as stated by De Laat et al. (2020).

With the help of AI-based technologies, students can follow their own pace, paths, preferences, and learning styles through adaptive and personalized learning systems. Such systems incorporate learner analytics, tracking behavior, and real-time outcomes to customize instruction (Luckin et al., 2016; Ma & Ismail, 2025; Pane et al., 2017). This is particularly applicable in secondary schools because learners are at different grades and developmental stages and have varying subject-specific abilities. Depending on the AI-based technologies, it is possible to identify areas of confusion and adjust accordingly beforehand or after; alter the content level; alter the mode of delivery: visual, auditory, or kinesthetic, and change it to what the student prefers (Brusilovsky & Millán, 2007; Holmes et al., 2021).

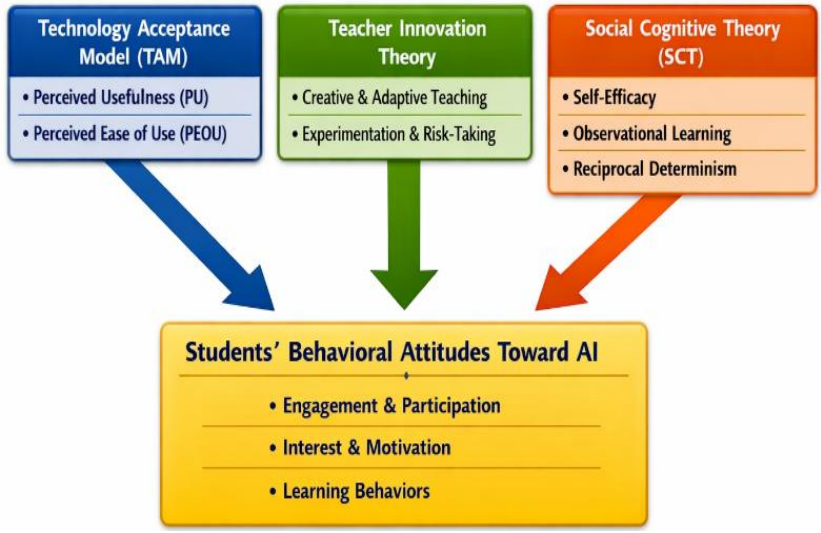
Pakistan, with its fast-growing young population, is poised to incorporate AI technology into its education system. In the country's context, the education system is riddled with issues, ranging from inequities across provinces in the levels of schooling offered to the presence of more than 22 million out-of-school children (Alif Ailaan, 2020). However, there are systemic opportunities these issues present that can be addressed through well-designed AI policies—namely, infrastructure that aligns with pedagogy rather than rote teaching frameworks and fixed curricula. Khan and Waqar (2023) found that while AI tools in Pakistani higher education offer personalization and efficiency, they also raise serious challenges around equity, ethics, and critical thinking. Furthermore, they highlighted both opportunities and risks that institutions must balance when using AI.

However, in secondary-grade classrooms, AI is increasingly being embraced, though it lacks formal policy support, mainly in line with efforts by the private sector and non-governmental organizations (NGOs). Holmes et al. (2021) noted that Edtech firms such as Sabaq, Edkasa, and Taleemabad are implementing AI-powered systems for personalized learning and adaptive assessments, as well as student engagement analytics. For instance, AI at Taleemabad recommends content based on a student's gaps and performance tendencies. However, with assistance from various tech companies, NGOs, and educational institutions, active, voluntary participation in AI design can be integrated into secondary schools across Pakistan. This thereby increases adoption and makes tools more accessible to students. Furthermore, co-design enhances foundational knowledge of AI technology, enabling contributors to become more informed and critical users who comprehend how these systems function (Luckin, 2017).

2.1 Theoretical Framework of the Study

The theoretical framework of this study is based on the premise that teachers' technology acceptance and innovative teaching practices are key drivers of students' behavioral engagement with AI, and it is situated within initiatives that encourage the integration of AI in secondary education globally. The theoretical background of this study includes the Technology Acceptance Model (TAM), Teacher Innovative Theory, and Social Cognitive Theory. The first, Technology Acceptance Model (Davis, 1989), indicates that teachers' willingness to adopt AI depends on their perception of its usefulness and ease of use. When teachers perceive AI as useful and easy to use, they are more likely to incorporate it into their teaching, reflecting the AI literacy and readiness of teachers and head teachers. Similarly, Teacher Innovation Theory (Liu et al., 2024) emphasizes teachers' ability to creatively adopt new technologies and teaching strategies, as teachers who demonstrate innovation in AI through experimentation, adaptation, and creative lesson design become role models and foster interest and curiosity in students towards AI. In the same vein, Social Cognitive Theory (Bandura, 1986) posits that students' self-efficacy and perceived relevance of AI influence not only their attitudes but also their academic engagement. When students believe they can use AI effectively and find it valuable for learning, their attitudes become more positive and proactive, and their confidence and enthusiasm strengthen their readiness to adopt AI for learning. Overall theoretical framework is shown in figure 1.

Figure 1: *Theoretical Framework of the Study*



3. RESEARCH METHODOLOGY

This quantitative study employed a descriptive and correlational approach to examine the relationship among variables such as teachers' AI application and innovation, students' attitudes towards AI (behavioral). The variables of the current study included the independent variables, such as teachers' AI application & innovation, and the dependent variables, like students' attitudes towards AI (behavioral).

The population of this study included all government high and high secondary schools in both tehsils of Quetta district, Chiltan and Zarghun, totaling 112 schools: 95 high schools and 17 high secondary schools, with 52 schools for boys and 60 for girls. The teacher population was 4,577 (1,597 males and 2,980 females), and the student population was 34,401 (20,928 at the high level and 13,473 at the high secondary level). The sample included 368 teachers (128 males, 240 females) and 394 students (216 males, 178 females) selected through stratified random sampling. Teachers are aged 41-50 years; the majority hold a master's degree and a B.Ed. as their professional degree, with 17-22 years of experience.

The students were in the 10th and 12th grades. For teachers, Ning et al.'s (2025) AILST scale was used to measure AI application and innovation, comprising 7 items (Cronbach Alpha = .604). This tool assesses teachers' ability to provide immediate feedback, use innovative teaching models, and employ AI creatively in teaching and learning. However, for the students, Suh and Ahn's (2022) SATAI scale was used to measure behavioral attitude, comprising 12 items (Cronbach's Alpha = .847). However, the students completed their questionnaires under the supervision of their teacher and the researcher, with assurances of anonymity and that participation was voluntary. Data analysis was performed using SPSS version 28, including descriptive statistics (Mean, SD, Frequencies) and inferential statistics (linear regression). Descriptive Statistics (Mean, SD, frequency) were used for demographics and variable levels. Reliability and validity were measured using Cronbach's alpha and CFA for construct validity. The Correlation Analysis (Pearson's r) was used to examine bivariate relationships.

4. FINDINGS

Research Question 1: What is the level of teachers' application and innovation with AI tools in Quetta?

Table 1 presents a descriptive analysis of teachers' AI applications and innovations. The mean for AI applications and innovations was M = 2.44 (SD = 0.507), which is close to the midpoint between "applicable" and "uncertain". However, a review of individual items revealed that item A1 had the lowest mean (M = 1.55, SD = 0.932), with 68.8% reporting that they do not know how to provide immediate feedback on student performance using AI. In item A2, 38% demonstrated the ability to anticipate potential problems in the application of AI and develop solutions (M = 1.79, SD = 0.757). In item A3, 25% demonstrated the ability to flexibly deal with unexpected situations in the event of AI failure in the classroom (M = 2.05, SD = 0.846).

However, item A6 had the highest mean (M = 3.23, SD = 0.948), with only 1.1% demonstrating the ability to develop innovative AI-based teaching models. In item A7, 4.9% expressed the ability to transfer the application of AI in one subject to other subjects (M = 3.11, SD = 1.160), while in item A5, 10.9% showed the ability to create creative and research opportunities through AI (M = 2.73, SD = 0.999). Though in terms of overall frequency, 32.2% of responses fell into the category of "uncertain", 31.1% "applicable", and 22.5% "fully applicable", while the responses of "not applicable" and "not applicable at all" were 8% and 6.2%, respectively

1=Fully Applicable, 2=Applicable, 3=Uncertain, 4=Not Applicable, 5= Completely Not Applicable

Table 1: *Descriptive Statistics for AI Applications and Innovations (Teachers, n = 368)*

	Question	1	2	3	4	5	M	SD
A1	I do not know how to use AI for real-time feedback (i-e, providing immediate feedback on student performance after completing tasks)	253 (68.8%)	46 (12.5%)	57 (15.5%)	5 (1.4%)	7 (1.9%)	1.55	.932
A2	I can anticipate potential problems in the process of AI application and develop solutions.	140 (38%)	173 (47%)	48 (13%)	5 (1.4%)	2 (0.5%)	1.79	.757
A3	I can handle unexpected situations arising from AI failures in classroom teaching.	92 (25%)	186 (50.5%)	76 (20.7%)	6 (1.6%)	8 (2.2%)	2.05	.846
A4	I can utilize AI to generate new teaching resources.	33 (9%)	108 (29.3%)	199 (54.1%)	18 (4.9%)	10 (2.7%)	2.63	.822

A5	I can flexibly apply AI to create situations rich in creativity and inquiry.	40 (10.9%)	99 (26.9%)	174 (47.3%)	29 (7.9%)	26 (7.1%)	2.73	.999
A6	I can innovate teaching models using AI.	4 (1.1%)	84 (22.8%)	138 (37.5%)	106 (28.8%)	36 (9.8%)	3.23	.948
A7	I can master the application of AI in a given subject and transfer that knowledge to other subjects.	18 (4.9%)	104 (28.3%)	137 (37.2%)	38 (10.3%)	71 (19.3%)	3.11	1.160
	Total	580 (22.5%)	800 (31.1%)	829 (32.2%)	207 (8%)	160 (6.2%)	2.44	.507

Research Question 2: What are students' behavioral attitudes toward using AI in learning?

For the high and high secondary school students, the Students' Attitudes towards AI were measured in the behavioral domain, comprising 12 items, as shown in Table 2. In the behavioral domain, the overall mean was M = 2.242 (SD = 0.549). The lowest means were for item 15, which states that "I want to work in the field of AI" (M = 2.11, SD = 0.721), and item 16, which states that "I will choose a job in the field of AI" (M = 2.11, SD = .719). However, the mean of item 24, which states that "It is interesting to use AI", was the highest (M = 2.44, SD = 0.929), with 55.3% agreement (40.6% agree, 14.7% strongly agree). Overall, the majority of responses (65.6%) agreed with the statements in the behavioral domain, with 45.1% "agreed" and 20.5% "strongly agreed". At the same time, 25.2% of the participants were neutral to the statements of the behavioral domain. The results show that the overall attitude of students of high and high secondary schools in Quetta towards AI was positive (M = 2.099, SD = 0.3786). The behavioral domain had a mean (M = 2.242), indicating that students were relatively cautious about the practical use of AI and making a career in its field in the future. Overall, students were aware of the importance of AI and had a positive attitude towards it.

Table 2: *Descriptive Statistics of Students' Attitudes Towards AI (n=394)*

Item	SA	A	N	D	SD	M	SD
I want to work in the field of AI.	65 (16.5%)	239 (60.7%)	72 (18.3%)	18 (4.6%)	0	2.11	.721
I will choose a job in the field of AI	64 (16.2%)	240 (60.9%)	72 (18.3%)	18 (4.6%)	0	2.11	.719
I would join an AI-related club if one existed.	78 (19.8%)	193 (49%)	89 (22.6%)	32 (8.1%)	2 (0.5%)	2.21	.868
I like using AI-related objects.	103 (26.1%)	160 (40.6%)	111 (28.2%)	19 (4.8%)	1 (0.3%)	2.12	.863
It is fun to learn about AI.	97 (24.6%)	152 (38.6%)	124 (31.5%)	18 (4.6%)	3 (0.8%)	2.18	.884
I want to continue learning about AI.	94 (23.9%)	165 (41.9%)	90 (22.8%)	45 (11.4%)	0	2.22	.937
I am interested in AI-related TV programs or online videos.	126 (32%)	133 (33.8%)	86 (21.8%)	47 (11.9%)	2 (0.5%)	2.15	1.020
I want to make something that makes	85	162	110	36	1	2.25	.906

human life more convenient through AI.	(21.6%)	(41.1%)	(27.9%)	(9.1%)	(0.3%)		
I am interested in the development of AI.	70 (17.8%)	185 (47%)	107 (27.2%)	26 (6.6%)	6 (1.5%)	2.27	.882
It is interesting to use AI.	58 (14.7%)	160 (40.6%)	127 (32.2%)	42 (10.7%)	7 (1.8%)	2.44	.929
I think that there should be more class time devoted to AI in school.	79 (20.1%)	148 (37.6%)	107 (27.2%)	47 (11.9%)	13 (3.3%)	2.41	1.040
I think I can handle AI well.	52 (13.2%)	193 (49%)	98 (24.9%)	33 (8.4%)	18 (4.6%)	2.42	.976
Total	971 (20.5%)	2130 (45.1%)	1193 (25.2%)	381 (8.1%)	53 (1.1%)	2.242	.5493

Research Question 3: To what extent do teachers' AI applications and innovations predict students' behavioral attitudes?

Research Hypothesis: Teachers' application and innovation with AI tools in education have a significant impact on students' behavioral attitudes (willingness to adopt/use AI in learning).

Table 3 reports the linear regression results testing whether teachers' AI applications and innovations statistically significantly predict students' behavioral domain scores. In continuation, the overall regression model was statistically significant and robust, $F(1, 7) = 452.019$, $p < .001$, indicating a strong structural relationship. Furthermore, the model's power and performance are evident in its ability to explain a record-breaking 98.5% of the total variance in changes in students' behavioral domain, as confirmed by these scores ($R^2 = .985$, Adjusted $R^2 = .983$). More importantly, the individual-effect analysis showed that teachers' use of AI tools and innovative attitude were highly significant and positive predictors of students' learning and adoption attitudes, $B = 1.180$, $\beta = .992$, $t(7) = 21.261$, $p < .001$. Consequently, in light of these final results, it is clearly shown that as AI applications and teachers' classroom innovation increase, there is a remarkable acceleration and positive change in students' behavior and tendencies in the same proportion. Based on this, the research hypothesis 7 (H_7) is accepted, which states that "teachers' application and innovation with AI tools in education have a significant impact on students' behavioral attitudes (willingness to adopt/use AI in learning)".

Table 3: *Linear Regression: Teachers' AI Application and Innovation Predicting Students' Behavioral Domain*

	R	**Regression**	**B**	**SE**	**β**	**t**	***p***
(Constant)	.992 ($R^2 = .985$)	1.547 (.000)	-.632	.135		-4.675	.002
Teachers' AI Knowledge and Skills			1.180	.055	.992	21.261	.000

a. Dependent Variable: Students' Behavioral Domain

5. DISCUSSION

5.1 AI application and Innovation

The level of AThe application and innovation in the current study under review ranged from "uncertain" to "applicable" among teachers (M = 2.44). In AI applications and innovation, the mean for item A1 was the lowest. This indicates that most teachers are unaware of how to provide immediate feedback using AI.

Similarly, the mean of item A6 (I can innovate teaching models using AI) was the highest in both groups. This result indicates the limited capacity of teachers to develop innovative teaching models.

According to the global literature, teachers who have received comprehensive training programs are much more confident in using AI tools than those without such training (Roshan et al., 2024). However, Rehman et al. (2024) suggested in their study that most training programs focus only on technical abilities, which is why teachers are unable to make meaningful use of AI in teaching. Additionally, Sajjad et al. (2019) have identified various institutional issues, such as limited infrastructure, inconsistent curricula, and inadequate teachers' training. These issues widen the gap between perception and practical application; therefore, it is imperative to provide teachers with modern tools and high-quality training. This way, they will be able to integrate AI into their daily teaching confidently.

5.2 Students' Attitudes toward the Adoption of AI in Learning

The behavioral domain had the highest mean (M = 2.242) in the students' attitudes. This shows that students are quite cautious about the practical application of AI and making a career in it. The mean for items 15 and 16 was the lowest of all items in the study (M = 2.11). Here, more than 60% of students agreed to work in AI and chose a career in the field. In contrast, the mean for item 24 was the highest (M = 2.44), with only 40.6% of students finding the use of AI interesting, a relatively low rate. According to Sultana et al. (2025), students consider AI a tool for completing assignments rather than a career. This limited thinking hinders innovation and motivation in AI. Furthermore, a study of 622 students by Zhang et al. (2025) demonstrated that AI literacy plays a key role in fostering professional interest in the field by increasing self-confidence.

Research has shown that practical experience with AI makes it easier to understand, and, according to Rehman and Sajjad (2024), AI literacy and positive attitudes play an important role in increasing self-confidence, as also confirmed by the current study's findings. Thus, according to systematic reviews by Bosarge (2025) and Yue et al. (2022), project-based learning promotes enthusiasm and professional aspirations among students, as the lack of practical activities in Quetta schools may be a major reason for low averages in the behavioral area. Hence, the establishment of AI clubs and career guidance programs in schools is the need of the hour. Overall, the attitude of students in government secondary schools in Quetta was found to be positive towards AI, as they were well aware of the social importance of this technology and its role in future employment. These results are fully consistent with the global literature. Furthermore, the results also show that students were somewhat cautious and hesitant due to the lack of practical training and hands-on learning activities, so in the context of global research, it is necessary to introduce AI clubs and project-based learning in schools instead of relying solely on theoretical education (Bosarge, 2025; Yue et al., 2022). Therefore, in Pakistan, it is imperative to include AI education in the curriculum, train teachers systematically, and initiate AI activities in schools so that students' positive emotions can be channeled into successful future careers and creative skills.

5.3 The influence of Teachers' AI Application and Innovation on Students' Behavioral Attitudes

In recent years, technological advancements have revolutionized education to bridge the gaps left by traditional strategies (Musawa et al., 2024). The adoption of these technologies will enhance teaching and delivery methods (Balouch et al., 2025). AI technology is one of the most promising and influential developments in education. It is being used to improve pedagogy and make learning experiences more engaging and successful in the rapidly changing world of education. Educators need to develop technological and pedagogical strategies (Sajjad et al., 2019) and acquire basic knowledge and skills to understand, create, use, apply, and evaluate AI applications to deliver content effectively in educational contexts (Rehman et al., 2023).

The study found that teachers' use of AI tools and innovative attitude were highly significant and positive predictors of students' learning and adoption attitudes. Research studies align with our findings, showing

that students' attitudes toward AI can play an important role in shaping their behavioral intention to use AI-powered apps more frequently in the future (Ajzen, 2020; Katsantonis & Katsantonis, 2024). Other studies show that teachers play a crucial role in shaping students' AI literacy and competency development (Chiu & Sanusi, 2024; Yue et al., 2024), providing them with opportunities to learn about AI and empowering them to build their conceptual understanding of AI's ethical considerations (Kong et al., 2023; Touretzky et al., 2023). Further, another study by Konecki et al. (2024) reveals that teachers have generally positive attitudes toward artificial intelligence, and this does highlight the need for more investment in teacher education and their understanding of AI tools so that they can inform their students about the advantages and disadvantages of using AI. So when teachers model AI use, their innovative pedagogy increases perceived novelty and usefulness, leading to higher student willingness to adopt AI. Combined with pedagogical and innovative practices, this creates a stronger classroom AI culture.

6. CONCLUSION

The results of the study "Analysis of Teachers' AI Application and Innovation and Students' Attitudes in Secondary Schools of Quetta" show that the level of teachers' AI application and innovation ranged from "uncertain" to "applicable", indicating a significant weakness in practical teaching skills. Thus, the lack of practical educational activities in Quetta schools seems to be the main reason for the low average in the behavioral area. The immediate establishment of AI clubs and career guidance programs at the school level is imperative to help students adopt AI as a meaningful field in their academic and professional lives. However, the analysis revealed an encouraging conclusion: the attitude of students in secondary schools in Quetta towards AI is positive, as they are well aware of the social importance of this modern technology and its key role in future employment. Therefore, these results clearly demonstrate that teachers' AI application and innovation have a direct and significant impact on students' behavioral attitudes. When teachers incorporate AI into teaching creatively and innovatively, students' willingness to learn and adopt AI increases proportionally.

7. RECOMMENDATIONS

The findings of the present study recommend maintaining research continuity so that future researchers can conduct experimental investigations examining the direct relationship between teachers' AI literacy and students' learning outcomes. Since this study was conducted within a limited timeframe and specific geographical boundaries, future longitudinal studies are needed to closely observe changes in attitudes toward AI over time. In addition, comparisons with other provinces and private educational institutions can provide more concrete, broadly applicable evidence on AI education in Pakistan to inform national policymaking.

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Conflict of Interest

Authors declared NO conflict of interest.

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REFERENCES

Abulibdeh, A., Zaidan, E., & Abulibdeh, R. (2024). Navigating the confluence of artificial intelligence and education for sustainable development in the era of Industry 4.0: Challenges, opportunities, and ethical dimensions. *Journal of Cleaner Production, 437*, 140527. https://doi.org/10.1016/j.jclepro.2023.140527

Aggarwal, A., Kumar, V., & Srivastava, R. K. (2025). Value creation and value appropriation using voice AI technology: integrating B2B and B2C marketplace. *European Journal of Marketing*, *59*(9), 2199–2243. https://doi.org/10.1108/EJM-06-2024-0463

Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. *Human behavior and emerging technologies*, *2*(4), 314–324. https://doi.org/10.1002/hbe2.195

Alam, A. (2021). Possibilities and apprehensions in the landscape of artificial intelligence in education. *International Conference on Computational Intelligence and Computing Applications (ICCICA)*, 1–8. IEEE. https://doi.org/10.1109/ICCICA52458.2021.9697272

Alif Ailaan. (2020). *Powering Pakistan for the 21st century: Education reform report.* Islamabad: Alif Ailaan.

Balouch, G. A., Saleem, S., & Rehman, F. (2025). Open, Adapt, and Achieve Digital Doors to Learning: Exploring How E-Learning Platforms and Professional Growth Transform Learning for Students with Special Needs. *THE PROGRESS: A Journal of Multidisciplinary Studies*, *6*(1), 109-120. https://doi.org/10.71016/tp/y00y2173

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice-Hall, Inc.

Bingham, A. J., Pane, J. F., Steiner, E. D., & Hamilton, L. S. (2018). Ahead of the Curve: Implementation Challenges in Personalized Learning School Models. *Educational Policy*, *32*(3), 454-489. https://doi.org/10.1177/0895904816637688

Bosarge, E. (2025, March 9–11). *Project-based learning and the AI4K12 framework in high school AI curriculum: A systematic review* [Paper presentation]. 2025 ASEE Southeast Conference, Mississippi State University, MS, United States. https://doi.org/10.18260/1-2--54189

Brusilovsky, P., & Millán, E. (2007). User models for adaptive hypermedia and adaptive educational systems. In *The adaptive web: methods and strategies of web personalization* (pp. 3–53). Berlin, Heidelberg: Springer Berlin Heidelberg.

Chachar, Z. A., Ullah, N., & Ujjan, S. B. (2023). Enhancing access and quality of secondary education in Balochistan: Identifying challenges and implementing effective solutions. *Journal of Development and Social Sciences*, *4*(3), 270–279. https://doi.org/10.47205/jdss.2023(4-III)27

Chiu, T. K., & Sanusi, I. T. (2024). Define, foster, and assess student and teacher AI literacy and competency for all: Current status and future research direction. *Computers and Education Open*, 100182. https://doi.org/10.1016/j.caeo.2024.100182

Coşkun, H. C. (2023). Reflection of the iceberg: Key issues and challenges of education in Balochistan. *Culture, Education and Future*, *1*(1), 47–65. https://doi.org/10.70116/298027413

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13*(3), 319–340. https://doi.org/10.2307/249008

De Laat, M., Ryberg, T., & Schreurs, B. (2020). Opportunities and challenges for learning analytics and AI in education. *British Journal of Educational Technology*, *51*(4), 1115–1118. https://doi.org/10.1111/bjet.12991

Dimitriadou, E., & Lanitis, A. (2023). A critical evaluation, challenges, and future perspectives of using artificial intelligence and emerging technologies in smart classrooms. *Smart Learning Environments, 10*(12), 1–20. https://doi.org/10.1186/s40561-023-00212-7

Ertel, W. (2025). *Introduction to artificial intelligence* (3rd ed.). Undergraduate Topics in Computer Science. Wiesbaden, Germany: Springer. ISBN 978-3-658-43101-3.

Farahani, M. S., & Ghasmi, G. (2024). Artificial intelligence in education: A comprehensive study. *Forum for Education Studies, 2*(3), 1–15. https://doi.org/10.59400/fes.v2i3.1379

Holmes, W., Tuomi, I., Kalermo, J., & Naik, R. (2021). *AI and Education: A critical view through the lens of human capability*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000381137

Huang, J. Saleh, S. & Liu, Y. (2021). A Review on Artificial Intelligence in Education. *Academic Journal of Interdisciplinary Studies, 10*(3), 206-217. https://doi.org/10.36941/ajis-2021-0077

Hwang, G. J., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision, challenges, roles, and research issues of artificial intelligence in education. *Computers and Artificial Intelligence, 1*, 100001. https://doi.org/10.1016/j.caeai.2020.100001

Imran, H., Safdar, G., & Qaiser, M. (2025). Impact of Digital Technology on Learning Outcomes of University Students: A Study of Rawalpindi and Islamabad, Pakistan. *THE PROGRESS: A Journal of Multidisciplinary Studies*, *6*(1), 18-34. https://doi.org/10.71016/tp/k0jyhv43

Kakar, I. U., & Bashir, S. (2023). The Role Of Universities In Achieving Sustainable Development Goal 4 In Balochistan. *Journal of Positive School Psychology*, *7*(2). 275–289.

Katsantonis, A., & Katsantonis, I. G. (2024). University Students' Attitudes toward Artificial Intelligence: An Exploratory Study of the Cognitive, Emotional, and Behavioral Dimensions of AI Attitudes. *Education Sciences*, *14*(9), 988. https://doi.org/10.3390/educsci14090988

Khan, S., & Waqar, A. (2023). Artificial intelligence in Pakistani higher education: Opportunities, challenges, and ethical considerations. *International Journal of Educational Technology in Higher Education*, *20*(1), 15. https://doi.org/10.1186/s41239-023-00315-7

Khanzode, K. C. A., & Sarode, R. D. (2020). Advantages and Disadvantages of Artificial Intelligence and Machine Learning: A Literature Review. *International Journal of Library & Information Science (IJLIS)*, *9*(1), 30-36. https://doi.org/10.17605/OSF.IO/GV5T4

Khurshid, J., Khurshid, N., Ashraf, N., & Arshad, A. (2025). Examining the Diverse Sources Influencing the Development of Pedagogical Content Knowledge (PCK) Among Educators in Various Educational Settings. In *Current Trends and Best Practices of Pedagogical Content Knowledge (PCK)* (pp. 31–40). IGI Global Scientific Publishing.

Konecki, M., Baksa, T. & Konecki, M. (2024). Teachers' Perception of AI and Their Attitudes Towards AI.In Proceedings of the 16th International Conference on Computer Supported Education (CSEDU)- Volume 1, pages 564–568, ISBN: 978-989-758-697-2; ISSN: 2184-5026 Proceedings Copyright © 2024 by SCITEPRESS– Science and Technology Publications, Lda.

Kong, S. C., Lai, M., & Li, Y. (2023). Scaling up a teacher development program for sustainable computational thinking education: TPACK surveys, concept tests, and primary school visits. *Computers and Education*, *194*, 104707. https://doi. org/10.1016/j.compedu.2022.104707

Liu, S., Yin, H., Wang, Y., & Lu, J. (2024). Teacher innovation: Conceptualizations, methodologies, and theoretical framework. *Teaching and Teacher Education, 145*, 104611. https://doi.org/10.1016/j.tate.2024.104611

Luckin, R. (2017). Towards artificial intelligence-based assessment systems. *Nature Human Behavior*, *1*(3), 0028. https://doi.org/10.1038/s41562-016-0028

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson. https://www.pearson.com/content/dam/one-dot-com/one-dot-com/global/Files/about-pearson/innovation/open-ideas/Intelligence-Unleashed-Publication.pdf

Ma, H., & Ismail, L. (2025). Bibliometric analysis and systematic review of digital competence in education. *Humanities and social sciences communications*, *12*(1), 185. https://www.nature.com/articles/s41599-025-04401-1

Musawa, I., Almalik, R., & Khan, M. (2024, February). Artificial Intelligence Adoption in Education: A Study on Attitudes, Readiness, and Intention. In the *14th International Conference on Industrial Engineering and Operations Management*.

Ning, Y., Zhang, W., Yao, D., Fang, B., Xu, B., & Wijaya, T. T. (2025). Development and validation of the Artificial Intelligence Literacy Scale for Teachers (AILST). *Education and Information Technologies*, *30*(12), 17769-17803.

Pane, J. F., Steiner, E. D., Baird, M. D., Hamilton, L. S., & Pane, J. D. (2017). Informing progress. *Seattle, WA: RAND*.

Priyadi, D., Widjajanti, E., & Kamari, A. (2025). Systematic literature review: Opportunities and strategies for implementing artificial intelligence in chemistry learning in Indonesia. *Jurnal Pendidikan Sains Indonesia*, *13*(1), 189–201.

Rehman, F., & Sajjad, S. (2024). Mental health in the digital age: Comparing AI counseling with traditional counseling among university students. *Journal of Social Sciences and Media Studies*, *8*(2), 9–20.

Rehman, F., & Sajjad, S. (2025a). Bridging Technology and Therapy: Exploring AI in Mental Health Services through Counselors' and Students' Perspectives. *Online Media and Society*, *6*(1), 31–44. https://doi.org/10.71016/oms/hn8an983

Rehman, F., & Sajjad, S. (2025b). Human touch or AI support: the moderating role of engagement in counseling satisfaction. *Human Nature Journal of Social Sciences*, *6*(1), 229–241. https://doi.org/10.71016/hnjss/j89cs763

Rehman, F., Omair, M., Zeeshan, N., & Khurram, S. (2024). Healthcare professionals' attitudes, knowledge, and practices concerning AI in relation to their clinical opinions and decision-making. *Human Nature Journal of Social Sciences*, *5*(4), 1–15. https://doi.org/10.71016/hnjss/bm22qh45

Rehman, F., Sajjad, S., Saleem, S., & Omair, M. (2023). How technology transforms students: unpacking its influence on daily life, academic learning, social bonds, and mental wellness. *Journal of Social Sciences and Media Studies*, *7*(2), 77–89. https://doi.org/10.58921/jossams.07.02.0303

Roshan, S., Iqbal, S. Z., & Qing, Z. (2024). Teacher training and professional development for implementing AI-based educational tools. *Journal of Asian Development Studies*, *13*(2), 1972-1987.

Safdar, G., & Fatima, F. (2026). The Use of Artificial Intelligence in Instagram and Facebook: Opportunities and Perspectives. *Online Media and Society*, *7*(2), 31-47. https://doi.org/10.71016/oms/bzpqyd66

Sajjad, S., Saleem, S., Rehman, M. F., & Scholar, M. P. (2019). Instructional planning and evaluation techniques used by teachers for their students with special needs. *Journal of Economics and Sustainable Development*, *10*(1), 101.

Sharma, P., & Rani, R. (2021). Artificial intelligence in education: A review of applications, challenges, and opportunities. *Education and Information Technologies, 26*(5), 1231–1248. https://doi.org/10.1007/s10639-020-10385-3

Suh, W., & Ahn, S. (2022). Development and validation of a scale measuring student attitudes toward artificial intelligence. *Sage Open*, *12*(2), 21582440221100463. https://doi.org/10.1177/21582440221100463

Touretzky, D., Gardner-McCune, C., & Seehorn, D. (2023). Machine learning and the five big ideas in AI. *International Journal of Artificial Intelligence in Education, 33*(2), 233–266. https://doi.org/10.1007/s40593-022-00314-1

Ullah, F., Haydar, B., & Arslan, M. F. (2024). Bridging theory and practice: AI applications in learning and teaching in Pakistan's education system. *Jahan-e-Tahqeeq, 7*(3), 180–204.

Uygun, D. (2024). Teachers' perspectives on artificial intelligence in education. *Advances in Mobile Learning Educational Research*, *4*(1), 931–939. https://doi.org/10.25082/AMLER.2024.01.005

Yasin, F., & Safdar, G. (2025). Exploring the Utilization and Understanding Level of Artificial Intelligence (AI) Technology among University Students in Pakistan. *Online Media and Society*, *6*(1), 55-69. https://doi.org/10.71016/oms/yaxkf444

Yue, M., Jong, M. S. Y., & Ng, D. T. K. (2024). Understanding K–12 teachers' technological, pedagogical, and content knowledge readiness and attitudes toward artificial intelligence education. *Education and information technologies*, *29*(15), 19505–19536. https://doi.org/10.1007/s10639-024-12621-2