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RESEARCH PAPER

Embracing Innovation: Teachers' Adoption of Artificial Intelligence in Education

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ABSTRACT

This study aimed to investigate the adoption of contemporary popular artificial intelligence tools ChatGPT, Google Gemini, Meta AI, and others by educators in Pakistan. Although AI can significantly improve education through its competence in content creation, personalized education, and improved management, however, it is uncertain to what extent AI is adopted by educators. Based upon the descriptive survey design the study investigated how teachers are utilizing AI technologies for academic purposes. The study adopted a purposive sampling method targeting educators across schools, colleges, and universities actively engaged with AI tools. An online survey was designed to gather data from the respondents. Descriptive analysis was used to analyze the frequencies, purposes, and usage patterns of AI. The findings revealed that ChatGPT is the most popular choice for educators being used by all the respondents, and Meta AI and Gemini were also popular. The daily use of AI for educational purposes was common among educators. Based on the growing popularity of AI among educators, the study recommends policy reforms regarding curriculum development for AI literacy, organizing focused training programs to promote effective AI utilization targeting gender inclusion, and providing personalized technical support to users across different age groups.

| **KEYWORDS** | AI in education, ChatGPT, Google Gemini, Meta AI, Teacher's adoption of AI |

Introduction

Artificial intelligence in education is a collection of algorithms applications and intelligent machines that support content creation, personalized education, flexible assessments, and effective management. AI analyses statistics to adapt education to individual learner needs. AI simplifies and significantly lowers the managerial workload and enhances teaching efficiency ("The Evolution of AI in Education: Past, Present, and Future," 2023).

AI has been extensively used in the education domain for the last 60 years. (Philippa Hardman, 2023). During this long period, the role of AI has extended offering transformative advantages to the field. Several AI tools including ChatGPT, Google Gemini, Meta AI, etc. enable teachers to be more focused and engaged. AI Technologies continue to grow and become increasingly available, but it is uncertain to what extent they are adopted and used by educators. Their adoption in education largely depends upon the understanding, readiness, and willingness of the educators.

AI tools such as ChatGPT, Google Gemini, or Meta AI have the potential to considerably enhance education. ("Artificial Intelligence in Education," 2024). They offer a wide range of functions for the creation of educational materials, personalized education, and organizational support, how and to what extent they are embraced by educators needs elaboration ("The Role of AI in Modern Education," 2024). Specifically, teachers' perception of AI technologies incorporation into education is largely unexplored (Tram, 2024).

Literature Review

Brief History of AI in Education

With systems like PLATO and Automatic Grader, AI was first introduced in the field of education in the 1960s. These AI systems facilitated personalized instructions and automatic grading of tasks. AI innovations have evolved around three phases.

Early Innovations (1960s to 1980s)

The early phase of AI use for education included the development of ITS (Intelligent Tutoring Systems) that followed one-to-one tutoring. This system was based upon the learning theories such as Programmed Instruction proposed by B.F. Skinner and Mastery Learning proposed by Benjamin Bloom. With the invention of microprocessors and personal computers in the 1970s, the development of ITS accelerated to a great extent ("History of Using AI in Education," 2024).

The Internet and Machine Learning (1990s to 2010s)

The second phase of AI use for education started with the appearance of the Internet, ITS used web service to build adaptive and personalized learning environments. Web 2.0 further allowed collaborative learning and social support ("History of Using AI in Education," 2024).

Generative AI and Language Models (2010s to Present)

The 2010s observed a substantial progression in the field with the appearance of Generative AI and language models. Generative AI is an artificial intelligence system capable of generating content in the form of text, images, voice, and codes. The language models as a subset of generative AI specialized in generating and understanding human-like text. Generative AI can be used extensively for content generation, and personalized education ("History of Using AI in Education," 2024).

Key Benefits of AI for Teachers

AI offers several benefits to teachers to enhance their teaching effectiveness. The benefits include:

Content Creation

AI simplifies and makes more efficient the teaching process by generating customized lesson plans and course contents ensuring full alignment with the course. ("Generative AI Tools for Teaching and Learning," 2024). This saves teachers time that they may use for preparation to better lesson delivery and student engagement (Brendan Clugston, 2024; Pavitra M, 2024).

Personalized Teaching

AI supports the analysis of learners' statistics to recommend tailored resources, activities, and teaching methods to meet individual learners' exclusive needs (Pavitra M, 2024). This provides a comprehensive and effective learning environment ensuring that each individual learner can excel.

Improved Teaching Practice

AI can analyze patterns in student behavior, engagement, motivation, and performance, and as a result can highlight areas for improvement in teaching methods

(Pavitra M, 2024). This enables teachers to continuously improve their approaches, ensuring their practices remain effective and aligned with learners' requirements (Niklas Vernersson, 2024).

Teachers' Adoption of Technology

A technology is productive only when it is embraced, and effectively used (Ahmed, Chandio, & Malkani, 2023). Teachers' adoption and integration of technology in education highly rely on their characteristics, experience, knowledge, and perspective of the technology. Knowledgeable and skilled teachers have higher possibilities to evaluate more thoroughly the usefulness of technologies including technology in teaching and learning (Lawrence & Tar, 2018). While AI-powered platforms have great potential to improve teaching, their actual advantages depend on how familiar and confident the teachers feel in using them.

Methodology

Research Design

This study used a descriptive research design to examine the teachers' adoption of AI tools, ChatGPT, Google Gemini, Meta AI, and others. Descriptive research systematically characterizes the state of a phenomenon (Ahmed, Laghari, & Siddique, 2024).

AI Tool Selection

This research study focuses on popular and widely used AI tools ("ChatGPT, Meta AI, and Google Gemini Lead the Way at AI Usage in 2024," 2024).

ChatGPT: A prevailing language model developed by OpenAI recognized for its conversational abilities, text generation, and capability to answer questions in an informative way.

Google Gemini: Developed by Google, an adaptable AI model with advanced proficiencies in text generation, code generation, and image comprehension.

Meta AI: Developed by Meta Platforms, AI models are recognized for their emphasis on social interaction and communication.

Table 1
Top AI tools in 2024

AI Tool	Usage Percentage
ChatGPT	22.3%
Meta AI	22.3%
Google Gemini	19.3%
Microsoft Capilot	10.1%
Snapchat My AI	8%
Microsoft Bing AI	8%
Adobe Firefly	5%
GetGenie	5%
Total	**100%**

Source: ("ChatGPT, Meta AI, and Google Gemini Lead the Way at AI Usage in 2024," 2024)

These AI tools were carefully selected based on their current popularity, accessibility, and potential for educational applications.

Population and Sample

The target population for this study comprised public and private sector teachers serving in schools, colleges, and universities across Pakistan. The study targeted individual educators using have experience with AI tools. A purposive sampling technique was utilized to select the participants.

Data Collection Tool

An online survey form was prepared on Google Forms, and the link was forwarded to respondent educators through their contact numbers, email addresses, and professional groups of school, college, and university teachers of both public and private sectors. Respondents provided insights on the different aspects related to the use of AI tools including:

- **Demographic Information:** Age, gender, designation, teaching experience, and educational qualification of the respondents.

- **AI Tool Usage:** AI tools used (ChatGPT, Google Gemini, Meta AI, and others), frequency of use, and specific purposes of use.

- **Usage Experience:** Overall experience with AI tools.

Data Collection Procedure

The study adhered to ethical guidelines throughout the research process ("Guidelines for Research Ethics in the Social Sciences and the Humanities," 2022). The survey included the purpose of the study and guidelines for attempting the research. This further included their rights as respondents, including withdrawal anytime during the survey, confidentiality, and privacy of responses.

Data Analysis

The collected data was analyzed using quantitative methods. Descriptive statistics through frequencies and percentages were used to analyze the quantitative data related to the usage patterns of AI tools by teachers, frequency of AI tool use, specific tools used, and purposes for which they were used.

Results and Discussion

The survey outcomes highlight the adoption of AI tools among educators, demonstrating respondents' demographics, and trends in usage patterns.

Table 2
Frequency and Percentage of Gender Groups

Gender	Frequency	Percentage
Male	47	92.16%
Female	4	7.84%
Total	**51**	**100%**

The gender statistics indicated that the majority of the respondents were males (92.16%), as compared to females (7.84%). This lower representation of females can be accredited for many reasons. They have less representation in the education field (UNESCO, 2021). Additionally, they are less accessible for participation (Hyde, 2005). Moreover, they may have limited time to respond due to increased responsibilities and they may have less familiarity with the research contents (Don A. Dillman, Jolene D. Smyth, & Leah Melani Christian, 2014).

Table 3
Frequency and Percentage of Age Groups

Age Group	Frequency	Percentage
Upto 30	19	37.3%
31-40	20	39.2%
Above 40	12	23.5%
Total	**51**	**100%**

The age group data indicated that the age group of 31-40 years was the largest participants group with 39.2% of respondents, closely followed by the age group of up to 30 years with 37.3%. The age group above 40 was represented by 23.5% of respondents. These insights are in line with the studies whose findings imply that AI adoption is particularly common among younger and mid-career educators, while older teachers might require additional support and training to increase their AI technology adoption rates (Srivastava Aniket, 2024).

Table 4
Frequency and Percentage of Academic Qualifications

Qualification	Frequency	Percentage
BS/MA/MSc	24	47.06%
MS/M.Phil.	22	43.14%
Ph.D.	5	9.80%
Total	**51**	**100%**

The qualification insights indicated that the qualification group BS/MA/MSc represented the largest no. of participants with 47.06%, the qualification group MS/M.Phil. remained close with 43.14%, and the qualification group Ph. D. was represented by 9.80%. These statistics reflect that the majority of respondents, 90.20%, are bachelor's or master's degree holders. The PhD holders are fewer in proportion, reflecting their scarcity in the teaching workforce, since a doctorate requires a great deal of time and resources.

Table 5
Frequency and Percentage of Teaching Experience

Career Level	Experience in years	Frequency	Percent
Highly Experienced	29	2	3.92%
	23	2	3.92%
	19	2	3.92%
	17	4	7.84%
	16	1	1.96%
Mid Experienced	15	4	7.84%
	13	6	11.76%
	11	2	3.92%
	10	2	3.92%
	8	4	7.84%
	7	4	7.84%
Early Experienced	5	10	19.61%
	4	4	7.84%
	3	4	7.84%
	Total	**51**	**100.00%**

The teaching experience of respondents, categorized into early, mid, and well-experienced groups, reveals that the majority are in the mid-career phase, accounting for 28 respondents (54.90%) with 6 to 15 years of experience. Early-career teachers, with 3 to 5 years of experience, constitute 18 respondents (35.29%), Highly experienced teachers, with 16 or more years of experience, make up the smallest group, totaling 5 respondents (9.80%). This distribution highlights a balanced representation across career stages, with a stronger

emphasis on mid-career educators, while also including perspectives from both early-career and highly experienced teachers.

AI Tools Usage Patterns

AI Tools

The insights on the use of AI tools by respondents reveal that ChatGPT is the favorite AI tool of the educators, used by all 51 respondents, which shows the wide acceptance of the tool. This is followed by Meta AI, with 40 respondents, which is 78.43%, while Google Gemini was reported to be used by 33 respondents at 64.71% of the total respondents. Further, ChatGPT is reported by 7 respondents at 13.73% of respondents as the standalone tool used.

The largest group of respondents 16 respondents (31.37%) use these tools in combination. The most frequent combination is ChatGPT, Meta AI, and Google Gemini. The second most frequent is ChatGPT and Meta AI by 12 respondents (23.53%). Among the least used tools, Copilot was mentioned by only 3 respondents, (5.88%), while GAUTH appeared in only 2 responses, (3.92%).

These statistics reflect that ChatGPT is used either standalone or jointly, while Meta AI and Google Gemini are combined for more functionality indicating the popularity of these tools ("ChatGPT, Meta AI, and Google Gemini Lead the Way at AI Usage in 2024," 2024).

Table 6
Frequency and Percentage of AI Usage Experience.

AI Usage Experience	Frequency	Percentage
Less than 1 year	12	23.53%
1 to 2 years	26	50.98%
2 to 3 years	8	15.69%
More than 3 years	5	9.80%
Total	**51**	**100%**

The AI technologies usage experience reflects a growth adoption trend. The largest group having used them for 1 to 2 years appears at 50.98%, with another 23.53% of respondents using them for less than 1 year indicating recent new widespread interest, While 15.69% of the participants have experience with AI for 2 to 3 years, only 9.80% have been working with it for more than 3 years. This reflects that while AI adoption is growing, there is a fair percentage of relatively recent users who likely require additional education and support in using the technology.

Frequency of Use

Table 7
Frequency and Percentage of AI Tools General Use

AI General Use Frequency	Frequency	Percentage
Daily	27	52.94%
Weekly	10	19.61%
Monthly	2	3.92%
Rarely	12	23.53%
Total	**51**	**100%**

The insights demonstrate that 52.94% of users use AI tools daily, indicating a high reliance on the tool in daily tasks. A smaller group, 19.61%, uses them weekly, showing less often consistency. Another 23.53% report using AI tools rarely, while 3.92% use them monthly, indicating minimal engagement. Overall, while daily usage is the most common, this indicates a range of frequency for users. The variation in usage suggests differing degrees of familiarity and the need for AI tools across the user base.

Table 8
Frequency and Percentage of AI Academic Use

AI Academic Use Frequency	Frequency	Percentage
Daily	31	60.78%
Weekly	6	11.76%
Monthly	4	7.84%
Rarely	10	19.61%
Total	**51**	**100%**

The data on AI tool usage for educational purposes shows that 60.78% of the users utilize the tools daily in pursuit of educational purposes, thus elaborating on the high utilization of AI for their educational routines. At the same time, 11.76% use these technologies weekly means they have more casual usage for educational purposes. 19.61% reported AI tool usage not often for educational activities, whereas 7.84% reported using them monthly, which indicates little engagement. In general, most users depend on AI tools daily for academic purposes, while a smaller portion uses them less frequently, reflecting the difference in the degree of dependence on AI in the educational context.

Findings

The findings indicate a compelling embracing of AI in educational practices.

The analysis revealed that males comprised 92% and females 8% of the respondents. The age group 31 to 40 years was found to be the largest group of respondents with 39.2%, followed by the age group 40 and above with 23.5%. A substantial majority of the responding educators 90.2% held a bachelor's or master's degree. Regarding teaching experience, the educators' group of 6 to 15 years 54.9% of the respondents. All of the respondents reported having used ChatGPT, Meta AI was also used by a significant 78.4%, and Google Gemini by 64.7% of the respondents. These AI tools were also reported to be used as a combination.50.98% of the respondents reported having used the AI tools for 1 to 2 years. Further, 52.94% of the respondents reported AI tools daily use. Similarly more than half of the respondents reported that they use AI for educational purposes daily.

Conclusion

The primary objective of this research was to explore the teachers' utilization of artificial intelligence tools ChatGPT, Meta AI, Google Gemini, and others for educational purposes. Employing a survey method the study collected quantitative statistics from the teachers of schools, colleges, and universities in Pakistan to investigate their adoption of AI in teaching and learning processes. Data were analyzed for descriptive analysis to comprehend the trends of AI usage by teachers.

Recommendations

Based on the insights, the study presents the following recommendations.

- **Professional Development Training:** Educational institutions should organize proficiency training programs to prepare teachers for the effective utilization of AI.
- **Policy Development for Integration of AI into Curriculum:** The policymakers in education reform curriculum to support AI literacy in educational settings. They should further prioritize ChatGPT, Meta AI, and Google Gemini in integration efforts.
- **Gender Inclusion:** Policymakers and educational institutions should take initiatives targeting to specifically encourage female participation in training programs.
- **Age-Based Targeted Support:** The elder educators have less AI adoption therefore, educational institutions must provide targeted technical support to them ensuring an increase in AI adoption and effective utilization.

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