
THE ROLE OF AI TOOLS IN LEARNING STRATEGIES OF PAKISTANI STUDENTS IN KARACHI

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Abstract:

In the field of education, AI tools could support students even for exam preparation. However, these opportunities are also countered by risks. Moreover, there is a lack of research about the role of AI tools in learning strategies of Pakistani students in Karachi. Therefore, this study explains the factors that shape their decision-making process, such as perceived benefits, learning styles, etc. It indirectly connects to SDG 4 (Quality Education). The theoretical framework was the diffusion of innovation theory. It is a primary and explanatory research with a small sample. The sample size was 20 university students. Convenient sampling method, a non-probability sampling method, was used. The universe was Karachi, Pakistan. The researchers gathered data through in depth interviews. Unstructured and open-ended interview guide was used to do in depth interviews. It is concluded that the perceived benefits of AI tools included personalized learning experiences, time management, and enhanced participation in the learning process. However, the study also identified certain limitations and issues with AI tools. Participants discussed the accuracy of the information offered by some AI tools, as well as the possibility of overreliance. The trend of the use of AI tools seems to be unstoppable. Pakistani students are Early Majority in the case of AI tools adoption for learning. It's a good sign. Therefore, Pakistani universities should rather play a role in promoting ethical and effective use of AI tools for learning.

Keywords: AI Tools, Learning strategies, University Students, SDG 4

Introduction

The influence of AI Tools extends to various domains of society, including the educational landscape (Ahmad et al., 2021) in Pakistan. It is crystal clear that the scope of AI tools in 2024 is rich and varied (Simplilearn, 2024) even in Pakistan. While, use of AI tool is unavoidable in the education sector (Ahmad et al., 2021), education sector has yet to determine whether it will be for the better or, the worse (Almusaed et al., 2023) in Pakistan. AI tools may adjust to students' knowledge, pace, and goals to maximize learning efficiency (Munir et al., 2022). Therefore, AI tools improve students learning performance (Agarwal & Chakraborty, 2019). It shows that, benefits of AI tools will eventually exceed the drawbacks. Consequently, AI tools will play an increasingly important role in the evolution of education (Almusaed et al., 2023).

However, more attention should be paid to teach ethical use of AI tools (Sijing and Lan, 2018) in Pakistan. The teachers already fear that students can write their assignments using only AI tool and claim that the AI work is their own. This raises the issues of ethics and plagiarism (Almusaed et al., 2023). Students from different departments use AI techniques to varying degrees For example,

- Geographically specialized students use Python for positioning
- Financial students can use AI for data analysis, etc.

The term AI stands for Artificial intelligence. It has its origins as early as the 1950s (Di Vaio et al., 2020). According to Nalbant (2021), the first AI work was done by McCulloch and Pitts in 1943. McCulloch and Pitts modeled neural networks and made the connection to propositional logic (McCulloch & Pitts, 1943). There is a strong demand for AI tools. Users are eager to adopt AI tools in their daily lives (Tam & Said, 2023). Students are the future of a country (Sijing and Lan, 2018). These AI tools help students in their studies (Essel et al., 2022) in Pakistan. AI-powered translation tools make study easier, especially for non-English speakers, (Almusaed et al., 2023) for example, Pakistani students.

In addition, AI tools can help students outside of the classroom (Photopoulos & Triantis, 2022). Through AI tools, students receive tailored recommendations for learning resources, customized feedback, and progress monitoring that aligns with their specific learning needs and preferences, even language preference (Almusaed et al., 2023). Daily repetitious queries assault teachers (Photopoulos & Triantis, 2022). AI tools allow students to learn 24/7, which lets students experiment without waiting for a teacher. AI tools save time by answering students' most common questions in seconds (Photopoulos & Triantis, 2022).

AI has potential to improve learning process. However, there are also some risks and limitations of AI. Therefore, there is a necessity to investigate the potential of AI for enhancing skills (Almusaed et al., 2023). However, according to Muthmainnah et al. (2022), most of the existing review studies have focused on assessing the impact of AI on the acquisition of particular language skills. There is also a Germany-wide study of the use of such AI tools by students in

the context of learning and teaching (Von Garrel & Mayer, 2023). A study also discussed the innovations and developments that artificial intelligence has brought to education (Nalbant, 2021).

Another study assessed the impact of Artificial Intelligence (AI) on education (Chen et al., 2020). However, there is lack of research on behavior and relevant characteristics of the use of AI Tools among students. Usage behavior with regard to AI tools is highly relevant as a research topic (Von Garrel & Mayer, 2023). Students today are digital natives, accustomed to technology (Boubker, 2024) and seeking interactive learning experiences. Traditional study methods, while valuable, may not always cater to the diverse learning styles and time management challenges faced by modern students.

Motivation drives most human activities (Ali et al., 2023) if the motivation behind a human behavior is recognized, then that human activity could be handled efficiently. This research was conducted with the aim of highlighting the role of AI tools in university student learning strategies in Karachi Pakistan. In other words, the study's focus is on understanding why and how university students use AI tools for learning. It indirectly connects to SDG 4 (Quality Education) by investigating how AI tools can improve educational outcomes. AI tools offer new possibilities for engaging students and catering to diverse learning styles. With ever-increasing workloads, students are constantly seeking ways to manage their time more effectively. AI tools for education are a relatively new phenomenon. This research contributes to a growing body of knowledge on how these tools are being used, their perceived benefits and drawbacks, and how they impact the learning process.

Objective

- To comprehensively understand how university students approach learning, including their use of AI tools, the factors influencing their adoption, the perceived benefits compared to traditional methods, and the overall impact on their learning experience, in the context of Karachi, Pakistan

Research Questions

- How do Pakistani students typically approach learning for their university courses?
- Which specific AI tools have Pakistani students used for their studies?
- What factors do influences their decision to use AI tools for learning?
- What specific benefits or functionalities do Pakistani students find most helpful?
- How do AI tools compare to traditional study methods Pakistani students have used?

Literature review

AI is rapidly transforming various aspects of society, including education. It creates new opportunities for learning beyond traditional classrooms (Srinivasa et al., 2022). This literature review highlights the growing importance of Artificial Intelligence (AI) in education.

Apparently, there is a Need for personalized support for students (Gupta & Chen, 2022). In this situation, AI tools have a positive Impact on education (Srinivasa et al., 2022).

Societies, organizations, work, and education are all affected, becoming a significant part of daily life. AI will change everything (Srinivasa et al., 2022). Traditional education often struggles with high student-to-teacher ratios, limiting personalized learning. AI offers potential solutions. (Gupta & Chen, 2022). According to according to Gupta and Chen (2022) supporting student academic success has been one of the major goals for higher education. However, low teacher-to-student ratio makes it difficult for students to receive sufficient and personalized support that they might want to. The advancement of artificial intelligence (AI) is helpful for assisting learning. According to Srinivasa et al. (2022), AI began as computer and computer-related technologies, and then moved to web-based and online intelligent education systems.

AI is still evolving and ultimately improving students' learning experience and the overall quality of education (Srinivasa et al., 2022). AI can personalize learning experiences, automate tasks like grading, and provide support for students with disabilities. It also allows for remote learning, as seen during the COVID-19 pandemic (Nalbant, 2021). Many countries are embracing AI integration into education, aiming to address learning issues and improve accessibility (Ahmad et al., 2021). According to Ahmad et al. (2021), certain nations, such as Singapore, have been motivated by technological advancements to intensify technology integration within educational environments. In conclusion, AI has influenced many sectors and education is one of them. It can resolve issues, such as content accessibility, teacher deficiency where a student can learn without stress or impacting others (Ahmad et al., 2021).

Nalbant, K. G. (2021) have discussed how necessary artificial intelligence is in education. According to him, artificial intelligence is an integral part of education. He also has discussed the conveniences, advantages, and disadvantages of artificial intelligence. The comfort that artificial intelligence brings to special (disabled) students for their education life and their contribution to their education and training were also examined in this study. In his study, the applications of artificial intelligence technologies in the world were also mentioned. Among these applications, Seeing AI, Virtual Assistants, Virtual Reality, Augmented Reality, Class craft, 3D Holograms, Chatbots, Vidreader, Quillionz were discussed.

AI is a powerful tool for education, offering new teaching and learning methods while resolving long-standing challenges (Ahmad et al., 2021; Luttrell et al., 2020). While according to Chen et al. (2020), Artificial intelligence has cognitive abilities, learning, adaptability, and decision-making capabilities. AI use humanoid robots and web-based chatbots to perform instructors' duties and functions independently or with instructors (Chen et al., 2020). Therefore, according to Sijing and Lan (2018), teachers should use different teaching strategies to teach students about the values of AI. At the same time, teachers should know the honest thoughts of students. In the

age of human-machine collaboration, teachers need more time to give emotional attention to students to prevent students from becoming dependent or overly reliant on machines.

This literature review showcases the potential of AI to revolutionize education by providing personalized learning, improving efficiency, and increasing accessibility. However, challenges and considerations regarding implementation remain. AI's role in education has progressed from computer-based systems to online platforms, and intelligent tutoring systems (Nalbant, 2021; Chen et al., 2020). However, Integrating advanced AI technologies in education presents challenges for educators and policymakers (Mageira et al., 2022).

Research Methodology

This is primary research because the researchers are not relying on existing data sources. It is a basic, qualitative, cross-sectional study with queries aimed at comprehending the present circumstance. It is an explanatory research with small sample size. This approach focuses on understanding the reasons or mechanisms behind a phenomenon. The theoretical framework was The Diffusion of Innovation Theory. This theory was developed by Everett Rogers in his book *Diffusion of Innovations*, in the 1960s (Rogers, 1995).

Universe: In this study, the researchers' universe was Karachi, Pakistan

Population: The population was consisted of those university students, whose nationality is Pakistani.

Sample Size: The study sample was consisted of 20 university students.

Sampling Method: In this qualitative research, the researchers used a convenient sampling method to select respondents. Convenient sampling method is a non-probability sampling method.

Data Collection Method: In depth interviews were conducted to gather in-depth data through personal meetings with university students in Pakistan.

Data Collection Tools: For the interview, the researcher used an unstructured, open-ended interview guide. To ensure reliable data gathering and accurate analysis, every conversation was first recorded and then transcribed.

Data Analysis: The researcher used the thematic analysis method to evaluate qualitative data.

Results and Discussion

Pakistani students are increasingly exposed to AI tools. This research explains the role of AI tools in learning strategies of Pakistani students in Karachi. This research also explains how Pakistani students perceive its impacts.

Themes: when the researcher tried to find out the role of AI tools, the following themes were emerged:

- approaches to learning:
- commonly used AI tools
- reasons

- benefits
- AI tools vs traditional study methods

Approaches to Learning: Respondents described how they typically approach learning for their university courses. Some students struggle with procrastination and test anxiety, leaving learning to the last minute (Respondents 1, 3, 7, 10, and 12) as shown in Table 1.

Table 1: Typical approaches

Respondents	Responses
Respondent 1	<i>"Every night, when I reach home, I only sleep and don't even eat. I only study one day before the exam, reviewing the notes I took in class."</i>
Respondent 3	<i>"I try to relax and then start preparing."</i>
Respondent 7	<i>"I put a lot of effort into exam preparation, but I get very stressed about exams. So, I only study a little bit on the last day. However, we should prepare for exams as we study. We should study for exams as we learn the material."</i>
Respondent 10	<i>"It's very difficult, because I have to cover too many notes and assignments at the same time "</i>
Respondent 12	<i>"It becomes very difficult to prepare when you sit down on the last day. Due to stress, you can't understand anything. You cry, wash your face, and stay up all night, but you still don't understand anything. You just have to do the paper somehow."</i>

Others take advantage of various resources like books, internet, AI tools, and collaboration with friends (Respondents 2, 6, 8, 9) while some find traditional methods boring (Respondent 9), As shown in Table 2.

Table 2: Other approaches

Respondents	Responses
Respondent 2	<i>"I use Google, Wikipedia, books, and ChatGPT and AI tools for study and exam preparation."</i>
Respondent 6	<i>"Before, I used to take notes on lectures. Now, with the help of AI, it's become easier."</i>
Respondent 8	<i>"We all friends combine all the notes we have, in one place, and then we memorize. If we don't understand something, we look it up on the internet."</i>
Respondent 9	<i>"Reading books and notes, etc. is boring, I leave it and then to prepare for the paper"</i>

There are students who prefer active learning methods like summarizing or rewriting information (Respondents 4, 15). Effective strategies include collecting materials beforehand (Respondent 11) as shown in Table 3.

Table 3: Active learning methods

Respondents	Responses
Respondent 4	<i>"I read books. I watch informative videos. I get knowledge from friends. Then I</i>

	write it down in my own words."
Respondent 15	"I see what topics were discussed in class and then I try to read about those topics on the net or ChatGPT in easy-to-understand words."
Respondent 11	"I collect notes and materials first to prepare for papers, so it will be helpful to make things sense."

Commonly Used AI Tools: Respondents discussed the use of AI tools for studies, with a focus on ChatGPT and the recently introduced Meta AI. ChatGPT is the most commonly mentioned tool (Respondents 2, 5, 7, 9, 16). Some learned about it from friends (Respondents 2, 5, 9). Respondent 5 highlighted the challenge of needing a data plan for ChatGPT, making Meta AI's WhatsApp integration appealing as shown in Table 4.

Table 4: *Most commonly used AI tools*

Respondents	Responses
Respondent 2 said	"Yes, I heard about AI tools a year back from my colleagues. I often use ChatGPT Nova AI chat for my study."
Respondent 5	"There are many tools that I haven't heard of, but I've heard about ChatGPT from friends at university. I only knew about ChatGPT from META, not the other tools. I first time used AI to get some answer. But, because of net package couldn't use ChatGPT when I saw my friend using Meta today. It felt like mixing cool water with hot water only on data. You can ask the answer to every question on Meta. I have a lot of workload."
Respondent 7	"I've heard that the META AI tool, the Snapchat AI tool, and ChatGPT are the best for learning. I also watch lectures on Google and YouTube. For study, I use YouTube, ChatGPT, Meta AI and Snapchat AI too."
Respondent 9	"I've heard of ChatGPT, Google paraphrasing, etc., but I didn't know much about them. I didn't know how to use them. When I came to know that, AI also helps in our studies. I also started using them like ChatGPT and Meta"
Respondent 16	"ChatGPT, Snapchat AI, META AI. I normally use Snapchat AI, for the paper preparation."

Meta AI is Gaining popularity due to its accessibility on WhatsApp (Respondents 5, 6, 7, 8). Respondent 6 found it easier to use than ChatGPT, as shown in Table 5.

Table 5: *Recent popular AI tools*

Respondents	Responses
Respondent 5	"There are many tools that I haven't heard of, but I've heard about ChatGPT from friends at university. I only knew about ChatGPT from META, not the other tools. I first time used AI to get some answer. But, because of net package couldn't use ChatGPT when I saw my friend using Meta today. It felt like mixing cool water with hot water only on data. You can ask the answer to every

	<i>question on Meta. I have a lot of workload."</i>
Respondent 6	<i>"I don't have much IT knowledge, so I just took help from YouTube than ChatGPT. I did a little work with ChatGPT. But it wasn't that helpful because there's always some issue with ID. Yes but, to improve English. I took help from Cambly app, and now I'm thinking of Meta AI which is very easy."</i>
Respondent 7	<i>"I've heard that the META AI tool, the Snapchat AI tool, and ChatGPT are the best for learning. I also watch lectures on Google and YouTube. For study, I use YouTube, ChatGPT, Meta AI and Snapchat AI too."</i>
Respondent 8	<i>"I haven't heard of any AI tools other than the ones my teacher uses. Previously we needed internet on Google or any other app, since Meta AI came on WhatsApp. It's become easy for us to ask questions. Even sitting in class we can see the answer to our questions."</i>

Snapchat AI is used for learning by some (Respondents 7, 16). Respondent 10 suggests it might be helpful for paper preparation. Nova AI chatbot is Used alongside ChatGPT by one Respondent (Respondent 2). as shown in Table 6.

Table 6: Other AI tools

Respondents	Responses
Respondent 2	<i>"Yes, I heard about AI tools a year back from my colleagues. I often use ChatGPT Nova AI chat for my study"</i>
Respondent 7	<i>"I've heard that the META AI tool, the Snapchat AI tool, and ChatGPT are the best for learning. I also watch lectures on Google and YouTube. For study, I use YouTube, ChatGPT, Meta AI and Snapchat AI too."</i>
Respondent 16	<i>"ChatGPT, Snapchat AI, META AI. I normally use Snapchat AI, for the paper preparation"</i>

Reasons: Respondents discussed the reasons why students use AI tools for learning. A major reason is to save time compared to traditional methods like reading books (Respondents 3, 4, 8, 12, 17) as shown in Table 7.

Table 7: Time saving

Respondents	Responses
Respondent 3	<i>"When I get time, I get the answer from ChatGPT in a short way."</i>
Respondent 4	<i>"Because it takes a long time to find answers from books and I can't read books much due to my busy schedule, I use AI tools more to save time. AI is very helpful because we don't have time to read books. I say that because along with learning, we have to do household chores too."</i>
Respondent 12	<i>"I use it for learning, especially for assignments, it is very helpful, everything is ready-made, I use it for shortcuts, it saves time."</i>

Respondent 17	<i>"Actually, I do a part-time job, so I don't want to burden my family too much, so I use AI for shortcuts too."</i>
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AI tools are seen as convenient and readily available (Respondents 2, 5, 7, 17). Meta AI's WhatsApp integration is particularly appealing for its ease of use (Respondents 5, 6) as shown in Table 8.

Table 8: Convenient

Respondents	Responses
Respondent 2	<i>"Because it is convenient to use AI tools for study rather than study from books. AI tools answer precisely to any question."</i>
Respondent 5	<i>"Actually, my interest was elsewhere. I didn't feel like going to the library and opening books. So, I used AI a lot. Whatever I wrote, it came up. I got rid of books. I wrote a question on my mobile and got the answer and then understood it."</i>
Respondent 6	<i>"AI tools are very important and helpful for this era. We don't get every topic on YouTube and the price of books is so expensive that we can't buy them for every small topic. In all this, Meta AI of WhatsApp is very helpful right now."</i>
Respondent 7	<i>"We use these tools because we are getting more convenience in reading now because of these tools. It is very helpful and it is a waste of time to take guidance from someone or go to tuition. So, we can easily study at home on the internet."</i>
Respondent 17	<i>"Actually, I do a part-time job, so I don't want to burden my family too much, so I use AI for shortcuts too."</i>

Students find AI tools provide concise and relevant answers compared to lengthy books (Respondents 5, 9, 13) as shown in Table 9.

Table 9: Provide concise and relevant answers

Respondents	Responses
Respondent 5	<i>"Actually, my interest was elsewhere. I didn't feel like going to the library and opening books. So, I used AI a lot. Whatever I wrote, it came up. I got rid of books. I wrote a question on my mobile and got the answer and then understood it."</i>
Respondent 13	<i>"There is a lot of length in books and AI tools etc. we get the answer to the point. It takes a long time to find out in books."</i>
Respondent 17	<i>"Actually, I do a part-time job, so I don't want to burden my family too much, so I use AI for shortcuts too."</i>

Benefits: The respondents highlighted various benefits. AI tools help access specific information or complete tasks efficiently (Respondents 1, 3, 6, 9, 18). Students mention saving significant time (Respondents 3, 4, 6, 18), as shown in Table 10.

Table 10: Efficiency

Respondents	Responses
Respondent 1	<i>"I got my questions answered in simple language from ChatGPT "</i>
Respondent 3	<i>"Once I had to make a history assignment and I needed some information that I couldn't find anywhere, even after searching a lot of places. Then I used ChatGPT and got the answer easily and in a short way, so I quickly copied it and submitted it to the teacher."</i>
Respondent 6	<i>"I recently struggled a lot for a presentation but I couldn't find any good or simple material. Then I made a presentation through Meta AI which was very good and simple."</i>
Respondent 9	<i>"I asked my friend to explain an essay to me but he refused, so I went to the hostel and took help from ChatGPT. He gave me the answer in easy words, so I felt relieved and I was very happy."</i>
Respondent 18	<i>"Last semester, I started psychology exam preparation two days before the paper because I was very busy before that. So I used AI so that it could be easily summarized and I could read it."</i>

AI tools can provide explanations in a clear and concise way, especially for complex subjects (Respondents 2, 7, 9). Some Respondents mention using AI tools to help summarize information or even create presentations (Respondent 18), as shown in Table 11.

Table 11: Summarize information and create presentations

Respondents	Responses
Respondent 2	<i>"AI tools provide the authentic knowledge we needed. It is helpful to save our time. And it answers our questions as a friend."</i>
Respondent 7	<i>"There are many benefits of using these tools. They have many advantages, which is why most people use them. For example, if we have problems in reading, such as chemistry or maths subjects, everything becomes easy. They help us make notes."</i>
Respondent 9	<i>"I asked my friend to explain an essay to me but he refused, so I went to the hostel and took help from ChatGPT. He gave me the answer in easy words, so I felt relieved and I was very happy"</i>
Respondent 18	<i>"Last semester I had a psychology paper and I only started two days before the paper because I was very busy before that. So I used AI so that it could be easily summarized and I could read it."</i>

AI Tools vs Traditional Study Methods: AI tools are changing the way students learn. According to respondents, AI tools can condense information and explain concepts quickly (Respondents 1, 10). They can simplify complex topics and translate languages, making them easier to understand for everyone (Respondents 1, 5, 6), as shown in Table 12.

Table 12: AI Tools are easier than traditional study methods

Respondents	Responses
Respondent 1	<i>"AI tool saves time. It develops my understanding about topics in easy wording, because I am not fluent in English language."</i>
Respondent 5	<i>"Differences are that, its time saving. It's better than searching a lot from other sources. It's a headache to find information from books. Plus, books contain hard words. These hard words are difficult to remember."</i>
Respondent 6	<i>"Cramming is not a good concept. Because we can't cram each topic. When we search things on META AI, gradually it automatically save in our memory. Then we are able to write a good material in our own wording."</i>
Respondent 10	<i>"Notes are lengthy, so it's very time taking to read notes for exam preparation. I can easily understand important topics by using AI tools. It gives exact answer of our each question. While, we have to find answers in books, by ourselves."</i>

This is especially helpful for busy students (Respondent7). Information is readily available at your fingertips, eliminating the need to search through multiple books (Respondents 2, 4, 19). Some respondents find AI tools more interactive and engaging than traditional study methods (Respondent 12). Some respondents talked about cost of books (Respondent 13), as shown in Table 13.

Table 13: AI tools are more interactive and engaging than traditional study methods

Respondents	Responses
Respondent 2	<i>"Traditional study was very time taking and boring. Our elders used to study many books to get the knowledge they required, so they need to work hard. But AI tools provide proficiency and precision. It is very easy to use AI tools for study. We easy get the knowledge we needed."</i>
Respondent 4	<i>"Ai tools make it convenient to understand. We don't have to check so many books."</i>
Respondent 7	<i>"Now a days life is so busy. Nobody has time to read books. AI is helpful in time management. AI tools make word to word accurate assignment for us."</i>
Respondent 19	<i>"There is a difference in AI usage and tradional study methods such as making notes, reading books, etc. sometimes we are late in class, so we can't note lectures properly. That's why AI tools are better option."</i>
Respondent 12	<i>"Using AI tools feels like talking to a friend. It gives answers to the point."</i>
Respondent 13	<i>"Traditional method is wrong. Teachers pressurize students to cram exactly what they taught. In today's era, it's easier to study with the help of AI tools then books. Books are costly. Books are hard to find. AI tools should be allowed and free of cost for students."</i>

Some challenges were mentioned by respondents. AI-generated information may not always be accurate, and users should be cautious about relying solely on it (Respondent 20). Traditional methods like reading books may provide a deeper understanding of a subject (Respondent 11). AI tools can be a great starting point, but traditional methods offer a more nuanced perspective. According to some respondents, Textbooks and reputable sources generally offer higher accuracy than AI-generated content (Respondent 20). Books provide a deeper dive into a subject, fostering a more comprehensive understanding (Respondent 11), as shown in Table 14.

Table 14: Accuracy

Respondents	Responses
Respondent 20	<i>"When we make notes from books and different sources, we have doubt about accuracy. But sometime even chatgpt provided me wrong information.it created problems for me."</i>
Respondent 11	<i>"There are so much difference in preparation by book method and Ai method. In my opinion the major difference is that book preparation takes so much time but books can't be replaced by any technology there is a huge respect that books hold(and there is zero percentage of wrong information and misguidance)while on the other hand Ai is time saving, quick and handy."</i>

A study showed that students performed better in exams by taking help from the AI tools (Essel et al., 2022). A study found that the dominant determinant of use behavior of AI tools was behavioral intention and personal innovativeness. Moreover, Habit, performance expectancy, and hedonic motivation were the best predictor of behavioral intention for using AI tools (Strzelecki, 2023). Furthermore, a study revealed six primary motivations for using AI tools among students. These were productivity, novelty, creative work, learning and development, entertainment, and social interaction and support (Skjuve et al., 2024).

Diffusion of Innovation Theory (DOI) by Everett Rogers proposed some key attributes that influence the adoption of new ideas and technologies, (Rogers, 1995). In accordance with this theoretical framework, This study revealed the specific AI tools being diffused. This study directly addressed the factors influencing adoption. Responses revealed the perceived relative advantage, compatibility, and complexity. This study reveals the relative advantage and compatibility of AI tools. Pakistani students compared the effectiveness, time commitment, and overall learning experience offered by AI tools against traditional methods like textbooks or lectures. This study helps to understand the factors influencing student decisions to adopt AI tools for learning. This study helps identify features that make AI tools appealing and areas for improvement to enhance their diffusion within Pakistani universities.

However, In a study, teachers have raised valid concerns regarding using AI tools by students (Almusaed et al., 2023). Teachers can use different teaching strategies to teach students about the values of AI (Sijing and Lan, 2018). Hargreaves and Stuart (2023) propose strategies teachers can employ to guide students in developing responsible and ethical AI tools usage skills. In the

age of human-machine collaboration, teachers need more time to give emotional attention to students to prevent students from becoming dependent or overly reliant on AI tools (Sijing and Lan, 2018). After all, technological advancement is inevitable and ongoing (Almusaed et al., 2023).

Conclusion and Recommendations

Innovation adoption follows a specific pattern, with individuals falling into different categories based on their willingness to try new things. These categories are Innovators, Early Adopters, Early Majority, Late Majority, and Laggards (Rogers, 1995). Pakistani students are Early Majority in the case of AI tools adoption for learning. It's a good sign. There is a need to understand how to promote the adoption of new technologies in Pakistan. Pakistani students reported using AI tools for various purposes, including breaking down complex material, enhancing understanding and promoting active learning. The perceived benefits of AI tools included personalized learning experiences, improved time management, and increased engagement in the learning process. Our study illustrates how AI tools can fulfill diverse needs of university students, as compared to traditional study method.

However, the research also revealed some limitations and challenges associated with AI tools. Concerns about the accuracy of information provided by some tools and the potential for overreliance on them were mentioned by Pakistani students. Additionally, the limitations of free versions of certain AI tools and the occasional technical hurdles faced by students point to the need for ongoing development and accessibility improvements. AI tools are a powerful addition to the learning strategies. However, they shouldn't replace traditional methods entirely. Pakistani students should use a combination of both for a well-rounded learning experience that leverages the strengths of each approach. It is clear that university students will keep using AI tools for learning (Almusaed et al., 2023) in Pakistan. Because, technology in learning activities is here to stay, for better or worse and new technology is continually being introduced. So, university teachers should try to move with the times rather than against them (Almusaed et al., 2023). Universities can play a role in promoting student awareness and understanding of ethical use of AI tools for learning. Workshops, training sessions, and curated lists of reputable AI resources could be offered to students.

Students can maximize the benefits of AI tools by using them strategically alongside traditional study methods. Critical thinking and source evaluation skills remain crucial when using AI-generated content. AI tools will also create opportunities for students who cannot attend universities regularly due to some disabilities or illness. Therefore, the researchers make a call for further research to explore the role of AI Tools for learning among university students with disabilities. Moreover, teachers use AI tools in teaching and making lectures too. Therefore, other researchers should explore the perceptions about use of AI tools for learning and teaching among university teachers. Such researches highlight the need for further examination of how AI tools could be adopted in learning and teaching (Strzelecki, 2023). This research emphasizes on

spreading awareness and knowledge about AI tools through mass media, opinion leader and interpersonal communication.

The findings of this study help us understand how AI tools affect the learning strategies of Pakistani students. This research provides valuable insights into the potential of AI tools to transform university education in Pakistan. The findings of this and future comparable studies could assist in adopting AI tools in education sector of Pakistan, where quality of education is already a social problem. This research received no external funding. The authors declare no conflict of interest. This article was made possible by Pakistani students in Karachi, who shared their personal experiences with researchers. The responsibility for the content and any remaining errors remains exclusively with the authors. All authors contributed, read, and approved the final manuscript. All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, or those of the editors and or those of the reviewers.

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