

## Empowerment of Artificial Intelligence in Learning Optimisation: Student Perceptions in Karachi, Pakistan

Lubna Oad, Rehmat Shah, Rozina Sewani, Nazir Ahmad,  
Naeem Akhtar and Muhammad Imran

<sup>1</sup>Department of Education, Benazir Bhutto Shaheed University Lyari Karachi, Sindh, Pakistan

<sup>2</sup>Division of Education, Department of Education, University of Education Lahore,  
Pakistan, Postal Code 54000

<sup>3</sup>Department of Education and Social Sciences, Iqra University, Karachi, Sindh, Pakistan

<sup>4</sup>Department of Education, Fatimiyah Higher Education System, Karachi, Sindh, Pakistan

<sup>5</sup>The Mercury Labs, Karachi, Sindh, Pakistan

<sup>6</sup>Department of Education, Shaheed Zulfikar Ali Bhutto Institute of Science and Technology  
Karachi, Sindh, Pakistan

E-mail: <sup>1</sup><lubnaparas@gmail.com>, <sup>2</sup><rehmat.shah@ue.edu.pk>,

<sup>3</sup><rozina.sewani@iqra.edu.pk>, <sup>4</sup><nazirahmed@fhes.fen.edu.pk>,

<sup>5</sup><Director@themercurylabs.com>, <sup>6</sup><imran.g583@yahoo.com>

**KEYWORDS** Academic Setting. Artificial Intelligence. Learning Optimisation. Learning Trends. Readiness

**ABSTRACT** This research aims to establish how Artificial Intelligence or AI influences higher learning, especially among students attending public universities in Karachi, Pakistan. They explain how AI is changing teaching and learning activities and has much potential to enhance education. The study was a cross-sectional, descriptive survey, involved 248 students from different universities selected by stratified random sampling, and the study instrument used was a self-developed questionnaire. This study indicates the positive potential of AI usage in improving the quality of teaching and learning while pointing out the existing issues in successful AI implementation, especially regarding the preparedness of students, the learning environment, and changing learning trends. The study shows a need to enhance the use of AI in education even as it acknowledges the challenges and hurdles that the use presents. Suggestions for future research are made to advance understanding of these issues and enhance the efficiency of AI use in academic environments.

### INTRODUCTION

Education and educational institutions have undergone many changes in recent years due to new technologies. Education is among the most critical parts of society because it is the backbone of civilised society (Paek and Kim 2021; Chiu et al. 2023). Moreover, most other sectors are associated with it, and it substantially impacts the people of society. One must adopt advanced technologies to face these challenges in a fast-changing and challenging world. Furthermore, Maphosa and Maphosa (2023) stressed that the learning and teaching processes in educational institutions have changed and are still changing because of how quickly new technologies are developing and constantly changing the ways of advanced teaching pedagogy (Pallathadka et al. 2022; Alshahrani 2023).

Consequently, emerging innovations revolutionise how teachers deal with their learners, leading to new ways of teaching and a different

atmosphere in traditional classrooms (Pallathadka et al. 2022; Hooda et al. 2022). Artificial Intelligence (AI) is one of these new technologies that is becoming more popular worldwide. Tools like AI 'chat-bots' and ChatGPT are developing more pervasively in human lives (Humble and Mozellus 2019; Kim et al. 2020; Cox 2021).

Furthermore, Ali (2023) revealed that artificial intelligence applications are indispensable in all spheres of life but especially essential for academic institutions. Nowadays, universities are vital in sustainability rather than only imparting knowledge in societies (Morin et al. 2021; Asim et al. 2023). Similarly, Abid et al. (2019) stated that Pakistani universities must constantly innovate new teaching and learning methods to remain competitive in today's technologically advanced world.

Additionally, Ali et al. (2022) argued that educational reform initiatives speedily adapted their academic frameworks to align with the demands of artificial intelligence. This was illus-

trated in the November 2017 plan for education and culture issued by the Gutenberg Summit, which focused on three key areas of fostering digital competencies and skills associated with digital transformation and enhancing the usage of artificial intelligence in the classroom (Bibi 2019); advance skills and education (Tahira 2021) through data analysis and insight (Ahmad et al. 2021; Tuomi 2022; Ali et al. 2022).

In the same way, Jamil et al. (2023) said that most teachers do not know how AI tools work because most are privately owned and untrained in the technology field. They are unfamiliar with using AI tools properly in their university teaching and learning process. According to Asim et al. (2023), universities in Pakistan are introducing new technologies gradually because of a lack of skilled and trained faculty members and infrastructure. Furthermore, Pakistani universities still do not incorporate AI tools education in their curriculum system. According to Rasheed et al. (2021), there is a lack of technological continuing education program structure in universities. Students encounter several obstacles while improving their understanding and proficiency with emerging technology. Thus, to address this gap, this research aims to examine students' perceptions about challenges with AI, as well as AI awareness, readiness, academic settings, and learning trends in the classroom.

### Objectives of the Study

To find out what can be done to improve AI tools, it is crucial to know that both students and teachers see the effects of these systems on their teaching-learning process. The following objectives are developed:

1. To investigate the perspectives of both males and females on the preparedness of higher education institutions for artificial intelligence.
2. To obtain the perspectives of both males and females on the educational setting of artificial intelligence at the university level.
3. To examine the perspectives of both males and females on the current state of artificial intelligence education at the university level.

### Research Questions

The study aimed to answer the following research questions:

1. What are the perspectives of both males and females on the preparedness of higher education institutions for artificial intelligence?
2. What are the perspectives of both males and females on the academic setting of artificial intelligence at the university level?
3. What are the perspectives of both males and females on the current state of artificial intelligence education at the university level?

### Literature Review

The rapid technological change of the fourth industrial revolution is causing significant shifts in organisational operations and the fields of education and business. This is mainly due to the influence of artificial intelligence (Shahroom and Hussin 2018; Tella and Ajani 2022).

According to Ali et al. (2022), all spheres of society are being transformed by artificial intelligence, and one of them is the education sector, in which AI also plays an important role in achieving educational goals. Furthermore, Artificial Intelligence (AI) systems help learning and teaching in valuable ways, like making learning more personalised for each student, automating teachers' everyday tasks, and running adaptive tests. Though AI has great potential, it is unclear how AI systems will influence the traditions, customs, and expectations surrounding how students and teachers engage with one another. Academic settings, including advanced technological resources and student-instructor engagement learning trends, including motivational communication, guidance, and support, significantly influence student learning. Because of this, it is crucial to find out how AI systems affect students' and teachers' learning trends to pinpoint any problems AI systems are having with their goals (Akgun and Greenhow 2022; Crompton and Burke 2023).

### Theoretical Background of Artificial Intelligence

Artificial Intelligence (AI) refers to the intelligence shown by machines instead of people. When people or animals show intelligence, one has consciousness and emotions, and the other does not (Ma and Siau 2018; Rasheed et al. 2021).

In 1959, McCarthy was the first to use artificial intelligence. Alan Turing popularised the notion in 1950 that computing machines might one day think like humans. He was convinced that automated machines would perform calculations in the future that humans could not logically perform. Artificial Intelligence (AI) development spans the phases of germination (1943-1955). It was the initial stage of the capabilities of machine learning. McCulloch and Pitts (1943) presented the first artificial neuron model in the middle of the 20th century. Further, in 1955, Princeton University created the first neuron computer, which helped advance artificial intelligence from its early stages. In the second phase of the formation period (1956-1980), computer use surged in several applied fields of information science, mathematics, psychology, etc. This stage began with the creation of artificially generated neural networks, which replicate the operations of the brain of humans, support automated learning systems, and increase computer processing power.

McCarthy (1959) ultimately suggested the concept of “artificial intelligence”. Researchers were quite interested in this idea, and several of them started studying people and working on artificial intelligence with positive results. During the third phase of application (1981 to 2000), early computer technology presented numerous challenges for artificial intelligence (AI). The application range of AI was limited, and its research progressed slowly. The years 2000 to the present, known as the Integration Period, are marked by recent revolutionary developments in artificial intelligence and its implications for the seamless interaction of human beings with machine intelligence. AI technology was advancing quickly because computer scientists could create various systems to meet consumers’ needs (Rasheed et al. 2021; Ahmad et al. 2021).

### **Readiness for AI at the Higher Education Level**

Students’ learning optimisation is associated with their readiness for advanced devices based on intelligent technologies (Ali 2023). Based on the findings of Mazzi (2023), students’ acceptance and readiness to learn artificial intelligence were predicted to be influenced by the recognition of artificial intelligence’s potential

to address problems associated with sustainable development goals (SDGs), including human rights, gender, and inequality. Furthermore, student readiness comprises various soft skills that adequately equip students’ cognitive faculties for effective learning. Additionally, students’ self-efficacy or self-concept is included, and their conviction over an occurrence is predicated on previous encounters (Al Shamsi et al. 2022). Adopting novel strategies or technologies, optimism and readiness are defined by a broader perspective.

Moreover, Sing et al. (2022) conducted research that revealed that the students’ perceptions of learning AI for societal good significantly predict their readiness to learn AI. Therefore, it is recommended that curriculum providers provide students with insights into using artificial intelligence tools (AI) practically to solve problems in the real world, as this may motivate them to explore the subject matter further. Moreover, research conducted by Sing et al. (2022) indicates that students may not instantly recognise their readiness for AI tools. However, students can be motivated by using AI for societal benefit, and students demonstrated an increase in self-assurance and readiness to employ AI tools in studies. Yousuf and Wahid (2021) found that AI tools can be used in universities to help students learn better. Technology improves teaching and learning through various techniques and resources for identifying educational materials.

To support the above idea, Luan et al. (2020) stated that in higher education, readiness for artificial intelligence (AI) integration is paramount to harnessing its transformative potential effectively (Paek and Kim 2021). However, higher education institutions still do not have the appropriate infrastructure to adopt advanced technologies. They must invest in infrastructure and technology upgrades to support AI implementation, including robust data systems and high-speed internet connectivity (Smith et al. 2024). Additionally, faculty and staff require comprehensive training and professional development because most of the teachers and staff are not trained to operate the AI-based tools and effectively utilise AI tools in teaching, research, and administrative tasks (Jones et al. 2022). Moreover, Shiohira (2021) stated that AI

uses unclear policies and guidelines. Policymakers and administrative concerns ensure ethical and responsible deployment, addressing problems related to data privacy, security, and algorithmic bias. Furthermore, he also found that collaborative partnerships between academia, industry, and government foster innovation and knowledge exchange, driving AI research and development initiatives in higher education (Browne 2021; García Peñalvo et al. 2024). Furthermore, Kim and Adlof (2024) argued that innovation of AI technologies and pedagogical approaches have a positive relationship and improve learners' learning capabilities.

Nguyen et al. (2023) stated that getting higher education ready for artificial intelligence tools also needs to consider socioeconomic problems and accessibility issues to ensure all students can access and participate equally. To address the digital age's changing technological and educational needs, preparation measures must be continuously assessed and adjusted as artificial intelligence (AI) develops. The educational paradigm of this century has changed. It is now learner-centred and service-oriented, with equal emphasis on technology and students (Damerji and Salimi 2021). In a nutshell, this is because of the usage of intelligent technology and the artificial intelligence that is integrated into it (Jamil et al. 2023). More functionalities and usage will be possible with increasingly more intelligent technologies. The learning outcomes for the students will be enhanced. Artificial Intelligence (AI) will improve students' intelligence and problem-solving abilities in the actual world by focusing on contextual and individualised learning. Students can learn more cooperatively, unconstrained by time or place (Cox 2021; Limna et al. 2022). Thus, the following hypothesis was formulated:

***H<sub>01</sub>:** The mean variance of opinions regarding readiness for AI does not significantly differ between boys and girls at the higher education level.*

#### **Academic Setting and Artificial Intelligence and Education**

Numerous new paradigms for teaching, learning, and students' self-efficacy are brought about by artificial intelligence technologies (Chiu 2021).

The best academic outcomes can be obtained in learning environments with computer skills (Limna et al. 2022). According to Demircioglu Diren and Horzum (2022), numerous methods and tools for retrieving learning content exist. By resolving problems with the conventional educational system that were preventing students from advancing their education, technological advancements have emerged as a powerful tool for enhancing educational opportunities.

Furthermore, to support this idea, Jamil et al. (2023) state that pupils' academic achievement may be improved by using artificial intelligence-based tools in AI education. Learners can utilise new ideas to advance innovation in their education. Similarly, AI-based machine learning teaching systems help teachers determine how well their students are doing in their classrooms and review the data about their habits and behaviours. Ali et al. (2022) did an empirical study that showed AI readiness can help people get better at skills and positively and significantly affect learning optimisation.

Similarly, Harisanty et al. (2023) found that students have many problems adopting AI-based education in universities. These obstacles included a lack of visionary leadership, organisational support, technological infrastructure, and power outages. Establishing an innovative educational environment and facilitating collaborative learning are two ways artificial intelligence (AI) benefits students and instructors (Hussain and Anwar 2024). The term learner empowerment is described as the facilitation of innovative pedagogies by creating intelligent settings through smart technology (Rasheed et al. 2021). It facilitates more learner-instructor engagement and gives access to educational learning resources (Morin et al. 2021). The main goal is to improve the learning level and the results students get as they go on an academic journey. To accomplish this, the approach emphasises transparent, contextual, and individualised instruction that fosters the development of students' intelligence and facilitates problem-solving in real-world scenarios. Students are granted personalised learning experiences that allow for flexible learning, collaboration, and location-independent study. Moreover, Pakistani universities still lack technological resources, and untrained facilitators and learners face challenges in enhancing their technical skills.



AI applications also improve learning environments and collaboration for students and professors. AI and education are changing academic teaching and learning. AI-powered technologies can transform education, student results, and administrative operations. AI-powered technologies enable personalised learning experiences tailored to student needs (Jones et al. 2022; Smith et al. 2023). AI chatbots are being utilised to provide rapid aid and guidance to students, enhancing their educational experience (García Peñalvo et al. 2024). However, virtual tutors and AI chatbots help students outside of class. Instructors need continual professional development and training to use artificial intelligence-based technologies in learning environments due to rapid technology innovation (Tan et al. 2021). Innovation and research in AI technologies for education require collaboration between academia, industry, and government (Wang et al. 2023).

Asim et al. (2023) proposed that institutional leaders play a crucial role in promoting AI literacy and advocating for AI-driven solutions to enhance student success and institutional effectiveness in their institutions (Chiu et al. 2023). Therefore, the researchers bring up the following hypothesis:

***H<sub>02</sub>:*** *The mean variance of opinions regarding academic setting for AI does not significantly differ between boys and girls at the higher education level.*

### **Learning Trends of AI at the Higher Education Level**

Integrating artificial intelligence (AI) in higher education drives significant shifts in learning trends (Smith et al. 2023). Virtual tutors and AI assistants provide instant support, answer queries, guide students through coursework, and promote self-directed learning (Jones et al. 2022). System observes information regarding outcomes of student's trends of AI, empowering primary involvement approaches to measure the gaps of prospective wisdom. Furthermore, construction utensils create collaborating and multimedia-rich knowledge resources by using AI to use miscellaneous strategies (García Peñalvo et al. 2024). Peer to Peer teaching and learning is promoted by Collaborative AI systems to an

energetic community through exchange of knowledge sharing (Kim and Adlof 2024). Moreover, assessment practices for teachers with the help of AI saves their time and assure them by adopting grading process and timely feedback to students (Chen et al. 2019). Nevertheless, matters with privacy, algorithmic unfairness and data safety are put in education through AI (Li and Gu 2023).

As described by the Nguyen et al. (2023), ethical reflections in using AI, which includes responsibility and fairness are critical for equal access to student and their learning consequences. AI should also be used and adopted by teachers in daily lesson planning, instructional strategies, curriculum development and enrichment (Tan et al. 2022).

According to Tahira (2021), despite these obstacles, AI has the unquestionable ability to revolutionise higher education, improve learning trends in Pakistani education, and prepare students for the demands of the workforce of the future. These opinions are in line with those of Hooda et al. (2022), whose study confirmed that as AI develops, learning trends in university settings can be improved. To fully utilise AI's potential and handle new opportunities and challenges in the field of higher education, more research and cooperation between educators, technologists, and legislators are necessary. Hence, the researchers arrive at the following hypothesis.

***H<sub>03</sub>:*** *The mean variance of opinions regarding learning trends for AI does not significantly differ between boys and girls at the higher education level.*

### **METHODOLOGY**

In order to gather information on university students' opinions about using AI-based applications to enhance learning outcomes, this study employed a descriptive survey approach. Stratified random sampling is used in the study to guarantee that both male and female students from a range of academic fields are represented. Two hundred and forty-eight students participated in this research study. A structured questionnaire was developed based on relevant literature and theoretical frameworks about AI in education. The questionnaire was based on closed-ended items to measure students' per-

ceptions, attitudes, and experiences regarding AI integration in learning optimisation. Before the data collection, the questionnaire was validated by subject and language experts to ensure its validity. Subsequently, the questionnaire was subjected to pilot testing with a limited cohort of 40 students (Creswell 2014). Input from pilot participants was utilised to enhance the survey instrument prior to comprehensive deployment. The independent variable is students' perceptions of AI facilitation in learning enhancement. During the research, the researchers complied with all ethical standards, including securing informed consent, preserving anonymity, and guaranteeing voluntary participation. Each participant received a comprehensive elucidation of the study's objectives, methodologies, and their rights. The research questionnaire comprised two components. The initial phase involved collecting students' gender and other demographic information, alongside their understanding of AI in education. A sample of 300 male and female university students was selected from four public sector universities. Students were picked from four universities, namely, Karachi University, Benazir Bhutto Shaheed University Lyari Karachi, Sindh Madressatul Islam University Karachi, and Federal Urdu University of Arts, Sciences and Technology. Out of 300 surveys, 248 responses were valid, while the re-

mainder was discarded owing to incompleteness and missing values. The response rate was 82.6 percent. The pilot-tested value demonstrated reliability at 0.690 according to Cronbach's Alpha. The comprehensive reliability of the scale is presented in Table 1.

**Table 1: Cronbach's Alpha**

<i>Cronbach's Alpha</i>	<i>Items</i>
0.938	27

### Data Analysis and Findings of Study

Table 2 provides the participants' details, including male (55%) and female (45%) students. The participants with both genders have academic qualifications wherein 91.5 percent had undergraduate degrees while 8.5 percent had graduate degrees. 32 percent of the students are between the ages of 17-20 years, 56 percent were between 21-23 years of age and 125 were more than 24 years of age. The students from every department of the universities participated. It included 20.6 percent participants from the departments of education, 19.4 percent from English, 13.7 percent from the international relationship (IR) department, 20.6 percent from commerce, 1.6 percent from the business department, 5.2 percent from media science, 4.8 percent from

**Table 2: Participant demographics**

<i>Demographics</i>		<i>Frequency</i>	<i>Percentage</i>
<i>Gender</i>	Male	136	55
	Female	112	45
	Total	248	100
<i>Academic Qualification</i>	Undergraduate	227	91.5
	Graduate	21	8.5
	Total	248	100
<i>Age</i>	17-20 years	79	32
	21-23 years	139	56
	More than 24 years	30	12
	Total	248	100
<i>Department</i>	Education	51	20.6
	English	48	19.4
	IR	34	13.7
	Commerce	51	20.6
	BBA	04	1.6
	Media Science	13	5.2
	Pharmacy	12	4.8
	CS/IT	25	10.1
	Accounting/Finance	10	4
	Total	248	100

the pharmacy department, 10.1 percent from the computer science and information technology department, and 4.0 percent from the accounting and finance department that participated in this research study.

A t-test was conducted to assess the difference in perspectives between male and female students concerning preparedness for AI in higher education in Table 3. The test results indicated no statistically significant difference in preparedness for AI at the higher education level between male and female students,  $t(246) = 0.939$ ,  $p = 0.349$ . The opinion of male students ( $M=3.337$ ,  $SD=0.958$ ) did not substantially differ from that of female students ( $M=3.199$ ,  $SD=0.925$ ). No significant disparities were observed in the perspectives of students regarding their preparedness for AI at the higher education level in Karachi, Pakistan, based on gender.

The findings of the t-test, which was used to determine if male and female students' opinions on their academic environment and artificial intelligence in education differed, are shown in Table 4. According to test results, there was no statistically significant difference between male and female students' academic environments or the use of AI in the classroom ( $t(246) = 0.508$ ,  $p = 0.612$ ). However, there was no discernible difference between the opinions of male and fe-

male students ( $M=3.176$ ,  $SD=0.976$  and  $M=3.252$ ,  $SD=0.992$ , respectively). Students' opinions of their academic environment and artificial intelligence in Karachi, Pakistan, did not significantly change based on their gender.

Table 5 presents the results of the t-test conducted to examine the significant differences in perceptions between male and female students concerning their learning trends of AI at the higher education level. The results of the test indicated that there was no statistically significant difference between male and female students, with  $t(246) = 0.817$  and  $p = (0.560)$ . The perception of male students ( $M=3.219$ ,  $SD=0.972$ ) did not show a significant difference when compared to the views of female students ( $M=2.991$ ,  $SD=0.889$ ). No notable differences were observed in the perceptions of students based on gender regarding the learning trends of AI at the higher education level in Karachi, Pakistan.

## DISCUSSION

The study aims to discover students' perceptions of existing AI practices at higher education levels in Karachi. Students were found to know the importance of using artificial intelligence tools in education. First, the study results conclude that they have positive and same

**Table 3: Comparison of students' gender on their readiness for AI at the higher education level**

Gender	N	Mean	S. D	df	t	P
Male	136	3.337	0.958	246	0.939	0.349
Female	112	3.199	0.925			

$p > 0.05$

**Table 4: Comparison of students' gender on their academic setting and artificial intelligence in education**

Gender	N	Mean	S. D	df	t	P
Male	136	3.176	0.976	246	0.508	0.612
Female	112	3.252	0.992			

$p > 0.05$

**Table 5: Comparison of student's gender on their learning trends of AI at the higher education level**

Gender	N	Mean	S. D	df	t	P
Male	136	3.219	0.972	246	0.817	0.560
Female	112	2.991	0.889			

$p > 0.05$

opinions about the readiness of AI in their education system. Similarly, Asim et al. (2023) stated that applying artificial intelligence fields such as computer technology, natural language processing (NLP), and intelligent adaptive learning has revolutionised traditional education. It positively influences teachers' performance (proactive behaviours) and optimises students' teaching (Huang et al. 2021). A critical analysis of the study brings out the importance of infrastructure and policy to enhance the use of AI to support learning. Current literature (Li and Gu 2023) shows that there is a lack of success in faculty training and curriculum redesign while students are prepared.

Second, the study results concluded that they have favourable opinions of males and females about the academic setting of AI in their education system, which is essential, and they suggest that AI has furnished universities and instructors with novel concepts for reforming instruction and empowering the education (Malliga 2024). AI (Artificial Intelligence) is important in education because it helps make learning and teaching more individualised. Artificial intelligence has changed how teachers should teach and how students learn. It can create a personalised educational plan based on each student's needs and learning style (Dishon 2017), offer an engaging and interactive learning experience, and keep track of their progress intelligently to help them learn better and faster. However, if one critically analyses the method it provokes many doubts as to the AI distribution in the population between different categories of citizens. Some groups of learners are more privileged than others when it comes to the use of AI in their higher learning process, which reinforces the possibility of widening inequalities in higher learning systems.

Third, the study results revealed that males and females have favourable opinions about the learning trends of artificial intelligence (AI) being used in their education system at the university level. As discussed in previous studies (Paek and Kim 2021; Tang et al. 2023), they emphasised that the main challenge to a paradigm shift is learning trends, including the skilled faculty with advanced technological knowledge (Yousuf and Wahid 2021), technical-based curriculum (Crompton and Burke 2023), and conducive en-

vironment would be available for the learner is provided by the university. If these essential resources and infrastructure are available, appreciated and innovative learning can be possible rather than traditional learning (Alshahrani 2023). Due to the increase in learning processes when using AI tools, learning trends have shifted by enhancing the individual learning processes. However, to implement AI in education means addressing certain challenges including faculty resistance to change, lack of skilled human resource in technology, and inadequate funding on infrastructure. It could become a process that is far from being linear, structured and teacher-centred if those challenges are met by AI.

Moreover, Ahmad et al. (2023) stated that artificial intelligence (AI) is becoming increasingly crucial for optimised and efficient learning. According to Shiohira (2021), AI can thoroughly assess students' cognitive performance on tests and daily life based on information collected and machine learning. It can also offer individualised teaching recommendations for students who struggle with certain concepts and issues, reducing learning time (Maphosa and Maphosa 2023) and enhancing learning effectiveness (Crompton and Burke 2023). Furthermore, students can receive quick help and guidance from AI-powered technologies like chatbots, virtual tutors, and intelligent tutoring systems, which expand the scope of learning outside traditional classroom settings. Supporting the above idea, Yau et al. (2023) found that AI assistants can answer questions, provide explanations, and offer guidance on coursework, enabling students to access help whenever needed, promoting self-directed learning to address learning gaps and encouraging academic success (Agupugo et al. 2024).

Optimising student learning through intelligent automation integration in higher education can improve student results and learners for the digital age (Paek and Kim 2021; Demircioglu Diren and Horzum 2022). In this regard, universities have embraced new technology in the past decade (Aasim et al. 2022). Higher education institutions can develop more individualised, interesting, and productive learning environments that satisfy the many needs of today's students by carefully and morally utilising AI technologies (Jamil et al. 2023). But using AI into higher



education also brings up important issues and difficulties. AI adoption should be integrated in learning with the traditional methods of teaching. Furthermore, there can be worries about how AI technology might replace teachers and the necessity of continual training and professional development to successfully integrate AI tools into teaching methods (Akgun and Greenhow 2022).

### CONCLUSION

The research gives a solid justification for integrating and utilising AI tools inside instructional settings. The findings support the rational use of AI tools and emphasise making experts more aware of the need to use AI tools in education. Administration and management focus more on using AI tools in different departments than in the universities' computer science and information technology departments. CS and IT departments utilise AI tools in their daily learning. Faculty members are trained in using AI tools in their daily teaching process. Administration and management pay attention to organising conferences and workshops for teachers to teach them about using AI tools during classes. Some budget allocations should be reserved for AI tools, and the resources for adapting advanced technologies at the university level should be provided. Information is also given to educational institutions, educators, and pupils about the appropriate utilisation of AI, including its areas of application and timing. Each party may interpret and apply the study differently based on their needs and preferences. Moreover, it allows the community to work together with AI-focused businesses. The last thing the researcher says is that academics should do more research on how AI will change the future of education at all levels.

### RECOMMENDATIONS

This study was only meant to be done in public universities in Karachi, so it can only be applied to one level of education in Pakistan. Another limitation of this study is the small sample size based on a quantitative mono-method survey design. Mixed methods can be applied to get more comprehensive results regarding using artificial intelligence to enhance students'

learning experiences in educational settings. The perceptions and practices can be compared with those of other higher education stakeholders, like faculty members and management, with their perspectives and experiences. Future research may explore several more AI systems that significantly influence education, such as grading, assessment, error-based learning, and virtual reality, which were not addressed in this study. Future studies may include additional aspects. Additionally, further investigation may include quantitative methods to assess the functions, effects and relationship of AI tools and teachers' professional development to enhance the generalisability of the findings in education settings.

### REFERENCES

- Aasim M, Katirci R, Akgur O, Yildirim B et al. 2022. Machine learning (ML) algorithms and artificial neural network for optimizing in vitro germination and growth indices of industrial hemp (*Cannabis sativa* L.). *Industrial Crops and Products*, 181: 1-9. <https://doi.org/10.1016/j.indcrop.2022.114801>
- Abid S, Awan B, Ismail T et al. 2019. Artificial intelligence: Medical student's attitude in district Peshawar Pakistan. *Pakistan Journal of Public Health*, 9(1): 19-21.
- Agupugo CP, Barrie I, Makai CC, Alaka E 2024. AI learning-driven optimization of microgrid systems for rural electrification and economic empowerment. *Engineering Science & Technology Journal*, 5(9): 2835-2851. DOI: 10.51594/estj.v5i9.1569
- Ahmad SF, Han H, Alam MM, Rehmat M et al. 2023. Impact of artificial intelligence on human loss in decision making, laziness and safety in education. *Humanities and Social Sciences Communications*, 10(1): 1-14. <https://doi.org/10.1057/s41599-023-01787-8>
- Ahmad SF, Rahmat MK, Mubarak MS, Alam MM, Hyder SI 2021. Artificial intelligence and its role in education. *Sustainability*, 13(22): 1-11. <https://doi.org/10.3390/su132212902>
- Akgun S, Greenhow C 2022. Artificial intelligence in education: Addressing ethical challenges in K-12 settings. *AI and Ethics*, 2(3): 431-440. <https://doi.org/10.1007/s43681-021-00096-7>
- Al Shamsi J H, Al-Emran M, Shaalan K 2022. Understanding key drivers affecting students' use of artificial intelligence-based voice assistants. *Education and Information Technologies*, 27(6): 8071-8091.
- Ali A 2023. *Assessing Artificial Intelligence Readiness of Faculty in Higher Education: Comparative Case Study of Egypt*. Master's thesis. Cairo, Egypt: The American University.
- Ali MY, Naeem SB, Bhatti R, Richardson J 2022. Artificial intelligence application in university libraries of Pakistan: SWOT analysis and implications. *Global Knowledge, Memory and Communication*, 73(1): 219-234. <https://doi.org/10.1108/GKMC-12-2021-0203>

- Alshahrani A 2023. The impact of ChatGPT on blended learning: Current trends and future research directions. *International Journal of Data and Network Science*, 7(4): 2029-2040. doi: 10.5267/j.ijdns.2023.6.010
- Asim M, Arif M, Rafiq M, Ahmad R 2023. Investigating applications of Artificial Intelligence in university libraries of Pakistan: An empirical study. *The Journal of Academic Librarianship*, 49(6): 1-9 <https://doi.org/10.1016/j.acalib.2023.102803>
- Bibi M 2019. Execution of artificial intelligence approach in human resource management functions: Benefits and challenges in Pakistan. *Sarhad Journal of Management Sciences*, 5(1): 113-124. <https://journal.suit.edu.pk/index.php/sjms/article/view/350>
- Browne M 2021. Artificial intelligence data-driven internet of things systems, real-time process monitoring, and sustainable industrial value creation in smart networked factories. *Journal of Self-Governance and Management Economics*, 9(2): 21-31.
- Chen L, Wang P, Dong H, Shi F et al. 2019. An artificial intelligence based data-driven approach for design ideation. *Journal of Visual Communication and Image Representation*, 61: 10-22. <https://doi.org/10.1016/j.jvcir.2019.02.009>
- Chiu TK, Xia Q, Zhou X, Chai CS, Cheng M 2023. Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence*, 4: 1-15. <https://doi.org/10.1016/j.caeai.2022.100118>
- Chiu WK 2021. Pedagogy of emerging technologies in chemical education during the era of digitalization and artificial intelligence: A systematic review. *Education Sciences*, 11(11): 1-24. <https://doi.org/10.3390/educsci11110709>
- Cox AM 2021. Exploring the impact of Artificial Intelligence and robots on higher education through literature-based design fictions. *International Journal of Educational Technology in Higher Education*, 18(1): 3.
- Creswell JW 2014. *Research Design Qualitative, Quantitative and Mixed Methods Approaches* 4<sup>th</sup> Edition. Thousand Oaks, California, United States of America: Sage.
- Crompton H, Burke D 2023. Artificial intelligence in higher education: The state of the field. *International Journal of Educational Technology in Higher Education*, 20(1): 1-22. <https://doi.org/10.1186/s41239-023-00392-8>
- Damerji H, Salimi A 2021. Mediating effect of use perceptions on technology readiness and adoption of artificial intelligence in accounting. *Accounting Education*, 30(2): 107-130. <https://doi.org/10.1080/09639284.2021.1872035>
- Demircioglu Diren D, Horzum MB 2022. Artificial intelligence based adaptive learning model for distance learning readiness. In: D Ifenthaler, S Seufert (Eds.): *Artificial Intelligence Education in the Context of Work*. Cham: Springer International Publishing, pp. 139-154.
- Dishon G 2017. New data, old tensions: Big data, personalized learning, and the challenges of progressive education. *Theory and Research in Education*, 15(3): 272-289.
- García Peñalvo FJ, Llorens-Largo F, Vidal J 2024. The new reality of education in the face of advances in generative artificial intelligence. [La nueva realidad de la educación ante los avances de la inteligencia artificial generativa]. *RIED-Revista Iberoamericana de Educación a Distancia*, 27(1): 9-39. <https://doi.org/10.5944/ried.27.1.37716>
- Harisanty D, Anna NEV, Putri TE et al. 2023. Is adopting artificial intelligence in libraries urgency or a buzzword? A systematic literature review. *Journal of Information Science*, 01655515221141034.
- Hooda M, Rana C, Dahiya O, Rizwan A, Hossain MS 2022. Artificial intelligence for assessment and feedback to enhance student success in higher education. *Mathematical Problems in Engineering*, 2022: 1-19. <https://doi.org/10.1155/2022/5215722>
- 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>
- Humble N, Mozeliuss P 2019. Artificial Intelligence in Education- A Promise, A Threat or a Hype. In: *Proceedings of the European Conference on the Impact of Artificial Intelligence and Robotics*, Oxford, UK, pp.149-156. <https://doi.org/10.34190>
- Hussain F, Anwar MA 2024. Towards informed policy decisions: assessing student perceptions and intentions to use ChatGPT for academic performance in higher education. *Journal of Asian Public Policy*, 1-28.
- Jamil H, Raza SH, Naqvi SG 2023. Artificial intelligence and grand challenges for education. *Journal of Policy Research*, 9(1): 317-322.
- Jones OT, Matin RN, van der Schaar M, Bhayankaram KP et al. 2022. Artificial intelligence and machine learning algorithms for early detection of skin cancer in community and primary care settings: A systematic review. *The Lancet Digital Health*, 4(6): e466-e476. [https://doi.org/10.1016/S2589-7500\(22\)00023-1](https://doi.org/10.1016/S2589-7500(22)00023-1)
- Kim HS, Jun S, Choi S, Kim S 2020. Development and application of education program on understanding artificial intelligence and social impact. *The Journal of Korean Association of Computer Education*, 23(2): 21-29. <https://doi.org/10.32431/kace.2020.23.2.003>
- Kim M, Adlof L 2024. Adapting to the future: ChatGPT as a means for supporting constructivist learning environments. *TechTrends*, 68(1): 37-46. <https://doi.org/10.1007/s11528-023-00899-x>
- Li S, Gu X 2023. A risk framework for human-centered artificial intelligence in education. *Educational Technology & Society*, 26(1): 187-202. [https://doi.org/10.30191/ETS.202301\\_26\(1\).0014](https://doi.org/10.30191/ETS.202301_26(1).0014)
- Limna P, Jakwatanatham S, Siripattanakul S, Kaewpuang P, Sriboonruang P 2022. A review of artificial intelligence (AI) in education during the digital era. *Advance Knowledge for Executives*, 1(1): 1-9.
- Luan H, Geczy P, Lai H, Gobert J, Yang SJ et al. 2020. Challenges and future directions of big data and artificial intelligence in education. *Frontiers in Psychology*, 11: 580820.
- Ma Y, Siau KL 2018. Artificial Intelligence Impacts on Higher Education. *Proceedings of the Thirteenth Midwest Association for Information Systems Conference (MWAI 2018)*, Saint Louis, Missouri
- Maphosa V, Maphosa M 2023. Fifteen years of recommender systems research in higher education: Current trends and future direction. *Applied Artificial Intelligence*,

- 37(1): 406-425. <https://doi.org/10.1080/08839514.2023.2175106>
- Mazzi F 2023. The intersections between artificial intelligence, intellectual property, and the sustainable development goals. In: F Mazzi (Eds.): *The 2022 Yearbook of the Digital Governance Research Group*. Cham: Springer Nature Switzerland, pp. 39-50
- McCarthy J 1959. *Programs with Common Sense*. [online] McCulloch WS, Pitts W 1943. A logical calculus of the ideas immanent in nervous activity. *The Bulletin of Mathematical Biophysics*, 5: 115-133. <https://doi.org/10.1007/BF02478259>
- Malliga T 2024. Empowering education: The vital role of artificial intelligence. In: T Premalatha, K Arunkumar, S Nithya (Eds.): *Changing Landscape of Education*. India: Shanlax Publication, pp. 44-48.
- Morin O, Vallières M, Braunstein S et al. 2021. An artificial intelligence framework integrating longitudinal electronic health records with real-world data enables continuous pan-cancer prognostication. *Nat Cancer*, 2(7): 709-722. <https://doi.org/10.1038/s43018-021-00236-2>
- Nguyen A, Ngo HN, Hong Y, Dang B, Nguyen BPT 2023. Ethical principles for artificial intelligence in education. *Education and Information Technologies*, 28(4): 4221-4241. <https://doi.org/10.1007/s10639-022-11316-w>
- Paek S, Kim N 2021. Analysis of worldwide research trends on the impact of artificial intelligence in education. *Sustainability*, 13(14): 1-20. <https://doi.org/10.3390/su13147941>
- Pallathadka H, Sonia B, Sanchez DT, De Vera JV et al. 2022. Investigating the impact of artificial intelligence in education sector by predicting student performance. *Materials Today: Proceedings*, 51: 2264-2267. <https://doi.org/10.1016/j.matpr.2021.11.395>
- Rasheed R, Ishaq MN, Rehman H 2021. Artificial intelligence in corporate business and financial management: A performance analysis from Pakistan. *Review of Education, Administration and Law*, 4(4): 847-860. DOI: <https://doi.org/10.47067/real.v4i4.205>
- Shahroom AA, Hussin N 2018. Industrial revolution 4.0 and education. *International Journal of Academic Research in Business and Social Sciences*, 8(9): 314-319. <https://doi.org/10.6007/IJARBS%2FV8-I9%2F4593>
- Shiohira K 2021. *Understanding the Impact of Artificial Intelligence on Skills Development. Education 2030*. UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training.
- Sing CC, Teo T, Huang F, Chiu TK, Xing Wei W 2022. Secondary school students' intentions to learn AI: Testing moderation effects of readiness, social good and optimism. *Educational Technology Research and Development*, 70(3): 765-782.
- Smith P, Johnson CE, Haran K, Orcales F et al. 2024. Advancing psoriasis care through artificial intelligence: A comprehensive review. *Current Dermatology Reports*, 1(7): 141-147. <https://doi.org/10.1007/s13671-024-00434-y>
- Smith RC, Schaper MM, Tamashiro MA, Van Mechelen M et al. 2023. A research agenda for computational empowerment for emerging technology education. *International Journal of Child-Computer Interaction*, 38: 100616.
- Tahira K 2021. Effects of artificial intelligence on human resources management a study of it sector in Pakistan. *International Journal of Online and Distance Learning*, 1(1): 61-77. <https://www.iprjb.org/journals/index.php/IJODL/article/view/1318>
- Tan SC, Lee AVY, Lee M 2022. A systematic review of artificial intelligence techniques for collaborative learning over the past two decades. *Computers and Education: Artificial Intelligence*, 3: 1-12. <https://doi.org/10.1016/j.caeai.2022.100097>
- Tan W, Patel D, Kozma R 2021. Strategy and Benchmark for Converting Deep q-networks to Event-Driven Spiking Neural Networks. In: *Proceedings of the AAAI Conference on Artificial Intelligence*, 35(11): 9816-9824. DOI: <https://doi.org/10.1609/aaai.v35i11.17180>
- Tang KY, Chang CY, Hwang GJ 2023. Trends in artificial intelligence-supported e-learning: A systematic review and co-citation network analysis (1998-2019). *Interactive Learning Environments*, 31(4): 2134-2152. <https://doi.org/10.1080/10494820.2021.1875001>
- Tella A, Ajani YA 2022. Robots and public libraries. *Library Hi Tech News*, 39(7): 15-18. <http://dx.doi.org/10.1108/LHTN-05-2022-0072>
- Tuomi I 2022. Artificial intelligence, 21<sup>st</sup> century competences, and socio emotional learning in education: More than high risk? *European Journal of Education*, 57(4): 601-619. <https://doi.org/10.1111/ejed.12531>
- Wang X, Li L, Tan S C, Yang L, Lei J 2023. Preparing for AI-enhanced education: Conceptualizing and empirically examining teachers' AI readiness. *Computers in Human Behavior*, 146: 1-11. <https://doi.org/10.1016/j.chb.2023.107798>
- Yau KW, Chai CS, Chiu TK, Meng H, King I, Yam Y 2023. A phenomenographic approach on teacher conceptions of teaching Artificial Intelligence (AI) in K-12 schools. *Education and Information Technologies*, 28(1): 1041-1064. <https://doi.org/10.1007/s10639-022-11161-x>
- Yousuf M, Wahid A 2021. The Role of Artificial Intelligence in Education: Current Trends and Future Prospects. In: *2021 International Conference on Information Science and Communications Technologies (ICISCT)*, Tashkent, Uzbekistan. DOI:10.1109/ICISCT52966.2021.9670009

**Paper received for publication in October, 2024**  
**Paper accepted for publication in December, 2024**