Analysis of AI Literacy among University Students in the Southern Punjab of Pakistan: An Exploratory Study
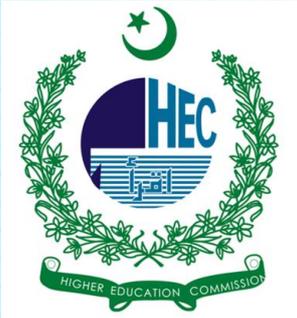
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Abstract

This research was conducted to analyze Artificial Intelligence literacy of university students in South region of Pakistan. Population of this study were the students of universities in Pakistan. Five hundred university students (259 male and 241 female students) from the four universities situated in district Rahimyar Khan, Punjab, Pakistan were taken as the sample of study. A self-developed questionnaire was used to collect the perception of university students about their level of Artificial Intelligence literacy. Mean score, frequencies and percentages were calculated to analyze the data. It was found that level of artificial intelligence literacy of university students was at medium level. The study provided evidence that university teachers should emphasize giving more awareness about the usefulness of AI tools. The study recommends and provides a way forward to the policy makers to develop mechanism for university students and teachers in the developing countries like Pakistan.

Keywords: AI Literacy, University Students, Pakistan, Analysis, Developing Countries

Introduction

Technology has drastically transformed the educational scene, giving up new opportunities and providing new obstacles for methods to teaching and learning (Aithal & Maiya, 2023). However, better academic results or higher educational quality are not assured by the sheer existence of technology. Influential how digital tools might help students in their education is crucial (Timotheou et al., 2023) . As a result, each technology type influencing the Edtech planetary must be investigated according to its unique features (Weller, 2022) . Artificial Intelligence (AI) is one new technology that is changing the face of education (Pedro et al., 2019). Based on data, AI can possibly make decisions, make predictions, and carry out tasks similarly to humans (Korteling et al., 2021) .

Researchers in the field of education contend that AI can improve human intelligence and learning processes when it is fully utilised (Zawacki-Richter et al., 2019). AI in Education (AIEd) has taken several forms, such as personalised tutors and collaborative learning support systems (Tapalova & Zhiyenbayeva, 2022). Understanding how AI especially affects students study customs and learning results is becoming more and more important as technology continues to change the educational countryside. The resolution of this study is to explore in detail how Swedish university students use AI as a study aid. We can learn a lot about the effectiveness of AI tools and their possible effects on academic achievement by investigating how students use them to enhance their learning process.

Applications of artificial intelligence (man-made awareness) in training are becoming more prevalent and have been particularly obvious in the last few years. The 2018 Skyline report clearly identifies artificial intelligence and developments in

malleable learning as important advancements in instructional innovation that might be implemented in two or three years. Although the Skyline Report 2019 Advanced education Version projects that computer-based intelligence applications related to teaching and learning will develop much more fundamentally than this, the report states that experts anticipate replicated intelligence in training to advance by 43% between 2018 and 2022 (Littman et al., 2022).

Giving teachers a general overview of artificial intelligence applications in higher education is the aim of this research. A evaluation of the literature on simulated intelligence in advanced education is defensible given the recent improvements and the growing interest of educators in this area (Dai & Ke, 2022) . Since research, development, critical thinking, or the application of the latest innovations are considered to be utilised by greatness in advanced education, artificial intelligence presents a unique opportunity to assist understudies in their learning process and in developing skills that better meet the demands of today's academic, professional, and personal lives. Organisations in higher education were not opposed to the growing influence of artificial intelligence, according to this line of reasoning.

At that time, artificial intelligence appeared to support advancements in higher education at various levels, affecting staff, students, other workers, and the organization's management itself, regardless of whether it causes discomfort or has the potential to influence growth (Chatterjee & Bhattacharjee, 2020). From watching TV to shopping online and all points in between, artificial intelligence is gradually permeating every part of our life. To put it another way, artificial intelligence is the study of computing systems and gadgets that are made by humans. These days, artificial intelligence is being discussed everywhere and is even making its way into the classroom.

AI will transform and enhance education, according to some, while others assert that it will assist in the education of pupils with impairments. Personalised tutoring, grading, education personalisation, course quality feedback, and immediate student response are only a few advantages of artificial intelligence (Maghsudi et al., 2021). The objective of this study was to analyse the AI literacy of university students.

Review of the Related Literature

Huge data, Fake Intelligence (AI) and internet of things (IoT) are slowly troublemaking many industries and it can completely change the education sector! One such model, the Chat Generative Pretrained Transformer (or Chat GPT in short) developed by Open AI, and trained on a myriad of text samples has taken the world by storm in this niche. In this chapter, we resolve also outline the basic perceptions of false intelligence (AI), big data, the internet of things (IoT), and procreative artificial intelligence (Gen AI) so that we provide our readers a minimum knowledge on these tools. We'll do this through a few varied examples within the field of education. Also in this chapter, brief similes of some foundational technical capabilities of AI will be reviewed so as to provide background knowledge upon which informed deductions

may be made about the implementation of AI in the laboratory.

Artificial Intelligence (AI)

Though the technology of artificial intelligence (AI) has been around for periods, we may promptly think of science fiction and polished robots when we reflect of AI. A man-made arrangement of computer-based algorithms and programs that can carry out responsibilities that normally need human astuteness is what is meant by the term artificial intelligence (AI). It can be found in software submissions that we use on a daily basis, like Microsoft Bing

Artificial Intelligence (AI) is the imitation of human intelligence in robots that are made to behave and think like people. AI is the process of creating models and algorithms that let computers learn from data and use that information to predict or decide.

The Viewpoint of Students

Effective Study Aids: AI, like Chat GPT, can act as an intelligent tutor when used appropriately. Learning new concepts, conducting research, editing content, and even improving problem-solving skills can all benefit from it. When paired with the improvement of students' critical evaluation abilities, AI has the probable to increase learning. Career Counselling: AI technologies help students make informed decisions about their future career pathways and employment marketplaces by evaluating data and predicting trends. This is especially advantageous.

Career Guidance

AI technologies help students brand well-versed decisions about their upcoming career pathways and employment marketplaces by evaluating data and predicting trends. This is especially helpful in conjunction with academic advising.

Free or Inexpensive Academic Support

AI has the ability to lessen the financial barriers that students face while pursuing their research and education. By offering free or reasonably priced research assistance and editing, generative AI broadens access to support resources that were previously pay-for-service when used appropriately and morally.

Faculty Perspective

Faculty benefit from the use of AI in the classroom as Big data, Fake Intelligence (AI) and internet of things (IoT) are slowly disrupting many industries and it can completely change the education sector! One such model, the Chat Generative Pre-trained Transformer (or Chat GPT in short) developed by Open AI, and trained on a myriad of text samples has taken the world by storm in this niche. In this part, we will also outline the basic concepts of fake intelligence (AI), large data, the internet of things (IoT), and generative artificial intelligence (Gen AI) so that we provide our readers a minimum knowledge on these technologies. We'll do this through a few varied examples within the field of education. Also in this chapter, brief descriptions of some foundational technical capabilities of AI will be reviewed so as to provide background knowledge upon which informed decisions may be made about the adoption of AI in the classroom.

Then we will examine why Chat GPT is game-changing for higher education what it can & cannot do and why it has gained popularity over the last few months. The end of the chapter will answer questions that we might have relating to the use of Chat GPT and AI in education. AI literacy means the information, skills, and competencies required for knowledge to understand, interact with, and critically assess AI systems. This encompasses the ability to recognize AI principles, recognize its applications, assess ethical consequences, and utilize AI technologies effectively (Ng et al., 2021). While technical skills are part of being AI literate, there are multiple dimensions to being AI literate, such as knowing how AI impacts society, privacy, and decision-making (Long & Magerko, 2020).

While AI literacy is often compared to digital literacy, it extends beyond it to include fundamental AI concepts, data-driven decision-making, and algorithmic thinking. It aims to empower citizens to use AI technologies wisely, intelligently, and ethically (Tinmaz et al., 2022) . AI literacy encompasses many aspects, including but not limited to conceptual understanding, technical skills, evaluative capacities, ethical implications, and societal implications.

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While AI literacy is often compared to digital literacy, it extends beyond it to include fundamental AI concepts, data-driven decision-making, and algorithmic thinking. It aims to empower citizens to use AI technologies wisely, intelligently, and ethically (Saxena & Bajotra, 2024) . AI literacy encompasses many aspects, including but not limited to conceptual understanding, technical skills, evaluative capacities,

ethical implications, and societal implications.

Although generative AI is still in its infancy, its application could be advantageous in a variety of educational settings. One important aspect will be educating people about the introduction and use of AI in educational contexts. The US Department of Education has identified a number of potential benefits for educators, such as: Administrative tasks that are automated and increased productivity: It is expected that generative AI would boost staff and researcher productivity by automating repetitive tasks. According to McKinney, 50% of the labor-intensive jobs performed today may be automated by 2030. AI has the potential to greatly reduce administrative workload and free up more time for student interaction by helping with assignment grading, student progress tracking, and class schedule management.

The Importance of AI Literacy

Understanding AI's workings, applications, and ramifications is crucial because of its wide range of potentials and drawbacks, which include elements that affect confidentiality, decision-making, and socioeconomic undercurrents. As a result, AI literacy is indispensable for deciphering the nuances and complexity included in technological systems and processes. Not only can being AI well-read help us use technology more effectively, but it also enhances our capacity to monitor, challenge, and direct the development of the digital world. People can make better results, plan more effectively, and have crucial conversations about the usage and regulation of expertise if they are aware of what AI can and cannot get done (Vinuesa et al., 2020).

Research Methodology

Design

A research designs the supreme plan for carrying out a study that describes the steps for gathering and evaluating data (Leavy, 2022). Quantitative, qualitative, and mixed methodologies research can all be conducted using different study designs. There are four different types of study designs used in quantitative research: experimental, causal-comparative/quasi-experimental, descriptive, and co-relational. The "Quantitative methodology" was the best research strategy for obtaining the necessary results based on the study's goals and nature. The rationale behind choosing a quantitative approach is that: i) it will help us accomplish our research objectives, which include analysing evaluation procedures in South Punjab's public universities. ii) The most effective approach for generalisation is quantitative technique. In general, data collection is beneficial. There are numerous methods for analysing the data that has been gathered in quantitative methodology. In this research, researcher used cross sectional survey method for the collection of data, because cross sectional survey method has many benefits (Marshall 1996). The cross sectional design was applied to the research.

Population of the Study

A population is a whole collection of individuals, whether that gathering is a society or a number of individuals who share the same characteristic (Lohr, 2021). Therefore, a population can be clear as any group of people who have a common trait. The

population of the study contained of all BS students enrolled in Punjab, Pakistan's public and private universities, taking into account the study's goals

Sample and Sampling of the Study

The detail group as of which you will collect data is known as a sample. The example size is permanently minor than the complete population possibly (Rahman et al., 2022). Five hundred bachelor's degree students were chosen using a multistage simple random sampling procedure from two public University named Islamia University Bahawalpur, Rahim Yar khan Campus and Khawaja Farid University of engineering and information technology. The two   private universities are   Superior University, Rahim Yar Khan and National College of Business Administration and Economics Rahim Yar Khan in Punjab. Its specifics are as follows:

Stage 1. Using random sample procedures, the researcher chose two public and two private universities in Punjab.

Stage 2. Six departments, equally represented in the social and scientific sciences, were selected from Islamia University Bahawalpur, Rahim Yar khan Campus, Khawaja Farid University of Engineering and information Technology and National College of Business Administration. Two departments were selected from Superior University, Rahim Yar for the second stage of data collection.

Stage 3. Twenty five BS students were conveniently chosen from each department.

Data Collection Instrument

Instrument of the research is a tool that can use to collect and evaluate information related to your research instruments (Ediyanto et al., 2022). A research instrument is a tool or method used by researcher to collect data from participants. The data acquired using the study instrument can subsequently be examined to derive conclusions and answer, interviews, observation checklists and standardising tests. The research design, research questions, and the kind of data being gathered all influence the choice of research instrument. The survey may be self-created, modified, or adopted. Self-generated questionnaire was utilized to collect data because the aims of study did not match with any tool currently existent. Because it is a popular research method that offers a rapid, efficient, and cost-effective means to collect a huge amount of data from a large sample, questionnaires are significant.

Development of Research Tool

After literature review questionnaire was developed. The questionnaire was categorized into two categories. First one is demographic profile of the respondents while second part consisted of closed ended questions. The close ended questions consisted of ten indicators. First is Understanding of AI concepts, second is AI Tools and Technologies, third part is about AI in everyday life, fourth is Perception and Attitudes toward AI, fifth is AI Education and Knowledge, Sixth is Awareness of AI Risks and Challenges, seventh is Access to AI Resource and Support, eighth is AI Awareness, ninth is General Understanding of AI and tenth is AI Usage and Exposure. Understanding of AI concepts indicator consisted of five statements. AI Tools and Technologies indicator consisted of five statements. AI in everyday life assessment

consisted of five statements. Perception and Attitudes toward AI consisted of five statements. AI Education and Knowledge consisted of five statements. Awareness of AI Risks and Challenges consisted of five statements. Access to AI Resource and Support consists of five statements. AI Awareness consists of five statements. General Understanding of AI consists of five statements. AI Usage and Exposure consisted of five statements. Five point likert scale like strongly disagree, disagree, neutral, agree and strongly agree was used to rate students answers.

Data Analysis

SPSS version 22 was used to input all of the data that was collected. The data were double –verified to guarantee that they were entered correctly. Values that were missing were added and the formatting was inverted whenever it was necessary. Following the processing of the data and the addition of the locking values the data folders were prepared for the analysis of the data. To provide an accurate portrayal of the data and provide answer to the research questions posed by the study, descriptive statistics, deviation, mean and inferential statistics, such as t test were utilized.

Analysis of the Data

Table 1: *Analysis of student's perception about Understanding of AI Concepts*

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
I have a clear understanding of basic AI concepts (e.g., machine learning, neural networks, deep learning)	23.4	44	67.4	13.0	32.8	24.8	77.8	3.2120.	Medium
I can easily explain what Artificial Intelligence (AI) is and how it works S	8.6	16.2	24.8	17.0	33.4	24.8	58.2	3.4960	Medium
I feel confident in identifying AI applications used in everyday life (e.g., recommendation systems, chatbots	9.4	13.0	22.4	18.0	35.2	24.2	59.4	3.5180	Medium

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
I am familiar with the role of data in AI systems	10.0	8.4	18.4	12.6	39.8	29.0	68.8	3.6900	High
I understand the ethical considerations surrounding AI development and usage	10.6	14.6	25.2	14.2	35.8	19.4	55.2	3.5020	Medium
Understanding of AI Concepts	12.4	19.24	31.64	14.8	35.4	24.44	63.88	3.4836	Medium

Table 1 reveals the perceived level of AI literacy of university students about Understanding of AI Concepts. Statistical results reveal that the level of university students' perception about understanding AI was medium. Similarly, the level of university students' perception about subsidiary factors of understanding AI was also medium. The results showed that university students perceived that the level of literacy about understanding AI and its subsidiary factor is not high and it should be improved.

Table 2: *Analysis of student's perception about* **AI Tools and Technologies**

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
I am capable of using AI I tools or platforms (e.g., Google AI, Tensor Flow, or machine learning software)	12.6	14.6	27.6	17.8	35.8	19.4	55.2	3.3500	Medium
I have I experience with programming languages commonly used in AI, such as Python or R	10.8	16.2	27	12.2	33.6	26.4	60	3.4842	Medium

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
I feel comfortable with using AI algorithms for solving problems	9.6	13.0	22.6	17.8	37.6	22.0	59.6	3.4940	Medium
I know how to train and test a basic machine learning model	8.6	13.8	22.8	15.4	39.4	22.8	62.2	3.5400	Medium
I know how to train and test a basic machine learning model	9.4	14.0	23.4	15.2	37.0	24.4	61.4	3.5300	Medium
AI Tools and Technologies	10.2	11.72	24.68	15.68	36.68	23	59.68	3.47964	Medium

Table 2 also reveals the perceived level of AI literacy of the university students about AI tools and technologies. Statistical results reveal that the level of university students' perception about AI tools and technologies was medium. Similarly, the level of university students' perception about subsidiary factors was medium too. Therefore, it implies that the students' level of literacy about AI tools, technologies and its subsidiary factor is not high and it requires measures to be taken by the policy makers as well teachers to improve students' level towards AI tools and technologies.

Table 3: *Analysis of student's perception about* **AI in Everyday Life**

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
I believe AI plays a significant role in improving productivity and efficiency in daily life	18.2	12.2	30.4	14.8	30.0	24.4	54.4	3.2980	Medium
I am aware of how AI is transforming industries such as healthcare, education, and	6.8	15.0	21.8	20.8	32.8	24.6	57.6	3.5340	Medium

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
business									
I actively use AI-powered tools or services (e.g., voice assistants, personalized content recommendations	15.2	7.8	23	22.2	32.8	22.0	54.8	3.3860	High
I believe AI will have a major impact on my future career prospects	9.8	12.2	22	17.2	35.4	25.4	60.8	3.5480	Medium
I recognize AI's potential to address complex societal challenges(e.g., climate change, public health).	14.6	12.2	26.8	19.0	31.2	22.6	53.8	3.664	Medium
AI in Everyday Life	12.92	11.88	24.8	18.8	32.44	23.8	56.28	3.486	Medium

Table 3 reveals the perceived level of AI literacy of university students about AI in everyday Life. The statistical results show that university students' perception about AI in everyday Life was found at medium level. Similarly, the level of university students' perception about subsidiary factors was also medium. It reveals that university students perceived that their level of literacy about AI in Everyday Life and its subsidiary factor is not high and it needs some corrective measures by the policy makers and the university teachers.

Table 4: *Analysis of student's* **Perception and Attitudes Towards AI**

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
I feel that AI systems are generally fair and unbiased in their operations.	8.8	10.8	10.8	19.6	34.8	26.0	60.8	3.5380	High
I feel optimistic about the future	8.8	15.0	23.0	17.4	31.2	27.4	58.6	3.5840	High

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
development of AI.									
I think AI can be trusted to make important decisions without human intervention.	7.4	14.2	21.6	14.0	36.0	28.4	64.4	3.5360	Medium
I am excited about learning more about AI and its applications	9.2	18.2	27.4	15.2	31.8	25.4	56.2	3.6380	Medium
I am concerned about the potential job losses due to AI automation.	14.8	12.0	26.8	17.8	30.8	24.4	55.2	3.4580	Medium
Perception and Attitudes Towards AI	9.8	14.04	21.92	16.8	26.76	26.32	59.04	3.5508	Medium

Table 4 reveals the perceived level of AI literacy of university students' about Perception and Attitudes towards AI. The statistical results in the table show that the level of university students' perception about Perception and Attitudes towards AI was medium. Likewise, the level of university students' perception about subsidiary factors and attitudes towards AI was also medium. It implies that university students perceived their level of literacy about Perception and Attitudes towards AI as well as its subsidiary factor is not high. Therefore, policy makers and university teachers should take some steps improve students' level.

Table 5: *Analysis of student's perception* **AI Education and Knowledge**

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
The university offers sufficient	10.2	15.0	25.2	18.4	35.0	21.4	56.4	3.3840	Medium

resources to learn about AI (e.g., courses, workshops, events).									
I have received adequate training in AI-related subject during my academic studies	10.6	14.4	25	18.8	29.2	27.0	56.2	3.4240	Medium
I believe that AI literacy is an important skill for my future academic and career success	11.6	12.0	24.2	20.0	32.6	23.4	56	3.4760	Medium
I am interested in pursuing further education in AI	10.2	11.6	21.8	13.6	32.6	32.0	64.6	3.4380	Medium
I think the university should offer more specialized AI courses or programs	11.6	12.0	23.6	18.4	31.0	27.0	58	3.6520	Medium

AI Education and Knowledge	10.84	13	23.96	17.84	32.08	26.16	58.24	3.4748	Medium

Table 5 reveals the perceived level of AI literacy of university students about AI Education and Knowledge. The statistical results in the table show that studetns' level of perception about AI Education and Knowledge was medium. Similarly, their level of perception about subsidiary factors of AI Education and Knowledge was also medium. It implies that university students perceived that their level of literacy about AI Education and Knowledge as well as its subsidiary factor is not high and it needs to be improved.

Table 6: ***Analysis of student's perception* Awareness of AI Risks and Challenges**

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
I am aware of the potential risks posed by AI, such as job displacement or privacy issues	9.4	13.6	23	17.2	34.0	25.6	59.6 .	3.4940	Medium
I understand the challenges related to AI's ethical use, such as bias in algorithms	10.2	12.6	23.0	20.0	33.2	24.0	57.2	3.5380	Medium
I am concerned about the security risks associated with AI, including data breaches and misuse	12.6	13.0	25.6	18.4	30.4	25.4	55.8	3.4820	Medium

I am interested in pursuing further education in AI	9.0	10.4	19.4	16.4	33.4	30.6	64	3.4280	Medium
I think there should be stricter regulations governing the use of AI technologies	14.0	9.4	23.4	18.0	32.8	25.8	58.6	3.7660	Medium
Awareness of AI Risks and Challenges	11.04	11.8	22.88	18	32.76	26.28	59.04	3.5416	Medium

Table 6 reveals the perceived level of AI literacy of university students about Awareness of AI Risks and Challenges. The statitical results in the table show that university students' perception about Awareness of AI Risks and Challenges was at medium level. Similarly, the level of their perception about subsidiary factors of Awareness of AI Risks and Challenges was also medium. It implies that university students perceived that their level of literacy Awareness of AI Risks and Challenges as well as its subsidiary factor is not high and it needs some corrective measures to be taken by the policy makers and university teachers to improve.

Table 7: *Analysis of student's perception* **Access to AI Resources and Support**

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
I have easy access to AI-related learning materials (books, articles, tutorials) at my university	9.2	16.8	26	17.0	34.6	22.4	57.	3.4700	Medium
The university provides sufficient	8.8	11.0	19.8	19.8	33.0	26.6	59.6	3.4420	Medium

support for students interested in AI, such as mentorship or research opportunities								
I feel that AI knowledge is not sufficiently emphasized in my academic program.	16.0	11.2	27.2	15.8	30.8	26.0	56.8	3.5806	Medium
I believe there should be more hands-on AI projects or internships available for students.	9.2	13.6	22.8	17.83	38.8	20.6	59.4	3.3968	Medium
I find the AI resources available at my university to be up-to-date and relevant.	14.2	12.0	26.2	13.6	31.2	28.8	60	3.4800	Medium
Access to AI Resources and Support	11.48	12.92	24.4	16.806	27.52	24.88	58.56	3.47388	Medium

Table 7 reveals the perceived level of AI literacy of university students about the Access to AI Resources and Support. The statistical analysis in the table shows that the level of university students' perception about the Access to AI Resources and Support was medium. Similarly, the level of university students' perception about subsidiary factors of Access to AI Resources and Support was also medium. It clearly implies that university students perceived that the level of literacy Access to AI Resources and Support as well as its subsidiary factor is not high and this level of the students should be improved.

Table 8:   *Analysis of student's perception* AI Awareness

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
I feel that my AI literacy is sufficient for understanding current AI related discussions	14.2	12.0	26.2	13.6	31.3	28.9	60.2	3.4850	Medium
I know where to find reliable information and resources about AI.	13.4	9.0	22.4	17.0	37.0	23.6	60.6	3.4840	Medium
I feel that AI literacy is an important skill for university students in the 21st century.	9.0	11.8	20.8	21.8	30.6	26.8	57.4	3.5440	Medium
I believe that AI literacy is essential for personal and professional growth	9.0	12.2	2.8	15.8	35.6	27.0	62.6	3.3820	Medium
I would like to improve my understanding of AI and its various applications	7.0	14.2	21.2	16.4	34.0	27.6	61.6	3.5940	Medium
AI Awareness	10.52	11.84	18.68	16.92	33.7	26.78	60.48	3.4978	Medium

Table 8 reveals the perceived level of AI literacy of university students about AI Awareness. The statistical analysis in the above table shows that the level of university students' perception about AI Awareness was medium. Similarly, the level of university students' perception about subsidiary factors of AI Awareness was also medium. It implies that university students perceived that their level of literacy AI

Awareness as well as its subsidiary factor is not high and this medium level of the university students should be focussed by the teachers to improve.

Table 9: *Analysis of student's perception* **General Understanding of AI**

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
I understand the basic concept of artificial intelligence (AI)	14.0	11.0	25	15.2	29.6	29.8	59.8	3.5060	Medium
I am familiar with the various applications of AI in everyday life.	11.4	13.8	25.2	12.4	32.8	29.2	62	3.4340	Medium
I believe that AI is a crucial technology for the future	10.8	13.8	24.6	19.4	32.4	23.6	55.4	3.4420	Medium
I can explain the difference between AI, machine learning, and deep learning	10.8	15.8	26.6	17.6	31.6	24.2	55.8	3.4260	Medium
I am aware of the ethical implications of AI technology	11.0	13.2	24.2	16.0	31.4	28.4	59.8	3.5300	Medium
General Understanding of AI	11.6	13.52	25.12	16.12	31.56	27.04	58.56	3.4676	Medium

Table 9 reveals the perceived level of AI literacy of university students about General Understanding of AI**.** The data in the table show that the level of university students' perception about General Understanding of AI was medium. Similarly, the level of university students' perception about subsidiary factors of General Understanding of AI was also medium. It implies that university students perceived their level of literacy Liberal Understanding of AI and its subsidiary factor is not high and it should be improved.

Table 10: *Analysis of student's perception* **AI Usage and Exposure**

Statement	SDA	DA	SDA+DA	N	A	SA	A+SA	Mean	Level
I regularly use AI-powered tools (e.g., voice assistants, recommendation systems) in my daily life	13.0	13.6	26.6	19.4	27.2	26.6	53.8	3.4088	Medium
I have participated in online courses or workshops related to AI	9.2	15.2	24.2	19.6	30.8	25.2	56	3.4760	Medium
I have access to AI-related resources (e.g., books, websites, databases) at my university	9.8	15.0	24.8	19.2	31.6	24.2	55.8	3.4560	Medium
I have access to AI-related resources (e.g., books, websites, databases) at my university	9.2	10.4	19.6	19.0	34.4	26.8	61.2	3.6740	High
I am encouraged by my university to explore AI topics in my academic or professional field	8.6	8.8	17.4	14.6	30.2	37.4	67.6	3.7932	High
AI Usage and Exposure	9.96	12.6	22.52	18.36	30.84	28.04	58.88	3.5616	Medium

Table 10 reveals the perceived level of AI literacy of university students about AI usage and exposure. The statistical results in the above table show that the level of university students' perception about AI usage and exposure was medium. Similarly, the level of university students' perception about subsidiary factors of AI usage and exposure was also medium. It clearly implies that university students perceived that

their level of literacy AI usage and exposure as well as its subsidiary factor is not high and it should also be improved.

Findings of the Study

- It was found that the university students perceived medium level of literacy regarding literacy of 'Understanding of AI concept and its subsidiary factor. It means that understanding of AI concept of university students was not at high level and it should be improved.

- It was revealed that university students perceived medium level of literacy regarding literacy of 'AI tools and technologies' and its subsidiary factor. It shows that AI tools and technologies of university students was not at high level and it needs improvement.

- It was assessed that university students perceived medium level of literacy regarding literacy of 'AI in everyday Life' and its subsidiary factor. It reveals that AI in everyday Life was not at high level and it should be improved.

- It was found that university students perceived themselves to be at the medium level of literacy regarding on 'Perception and Attitudes towards AI' and its subsidiary factor. It implies that their perception and attitudes towards AI' was not at high level which needs to be improved.

- It was found that university students perceived themselves to be at the medium level of literacy regarding literacy on 'AI education and knowledge' as well as its subsidiary factor. It reveals that AI education and knowledge was not at high level which needs to be focussed for improvement.

- It was noted that university students perceived themselves to be at the medium level of their literacy regarding literacy of 'Awareness of AI risks and Challenges' as well as its subsidiary factor. It was implied that Awareness of AI risks and Challenges not at high level and plolicy makers should take into account while giving a policy that should address medium level of the students.

- It was also found that university students perceived themselves to be at the medium level of their literacy regarding literacy of 'Access to AI resources and Support' as well as its subsidiary factor. It shows that Awareness of AI risks and Challenges' was not at high level and it should be improved.

- It was also seen that university students were at the medium level of literacy regarding literacy of 'AI awareness' as well as its subsidiary factor. It implies that 'AI awareness' was not at high level and it should be improved.

- It was revealed that university students perceived to be at the medium level of literacy regarding literacy of 'General understanding of AI' and its subsidiary factor. This situation clearly shows that general understanding of AI not at high level and it should be improved.

- It was found that university students were finally foud at the medium level of literacy regarding literacy of 'AI usage and exposure' and its subsidiary factor. It means that'AI usage and exposure were not at high level and it should be improved.

Discussion

A complicated interaction between educational frameworks and student perspectives is revealed by the research of AI literacy among university students in Pakistan. A study looking at the conceptualisation of AI literacy emphasises the necessity of a paradigm change away from conventional educational models and towards the ones that includes ethical and social reflection as essential elements of AI literacy (Cerny, 2024). This change is important because it brings AI literacy into line with more general societal literacy profiles and encourages teachers to use models based on ecological or network dynamic interactionist ideas. In addition to improving students' comprehension of AI, this method equips them to interact with AI in a way that is socially acceptable.

Additional research on AI literacy programs also shows how well they work to improve students' comprehension of AI ideas from a variety of academic backgrounds (Kong et al., 2023). Regardless of their past programming experience, university students who took a course on machine learning, supervised learning, and other AI-related subjects that showed notable gains in their understanding. This implies that well-designed educational programs that use cutting-edge teaching strategies, like flipped classrooms, can successfully foster AI literacy. In order to promote early engagement with AI technologies, the success of these courses highlights the possibility of extending AI literacy initiatives to more extensive educational contexts, such as secondary education.

This relationship underscores the significance of incorporating AI literacy into educational curricula, not only to improve technical skills but also to develop critical thinking and problem-solving abilities. Moreover, research shows a positive correlation between AI literacy and the ability to use AI tools effectively, which leads to more efficient completion of academic tasks (Male et al., 2025). Students with higher levels of AI literacy tend to engage more deeply with AI technologies, which results in improved learning outcomes and academic performance (Singh et al., 2025). By prioritising AI education, institutions can equip students with the skills they need to navigate and thrive in an increasingly AI-driven world.

Conclusions and Recommendations of the Study

It was concluded that university students' literacy level of artificial intelligence (AI) was at medium level. As the level of AI literacy of university students was not at high level, to students still need to enhance their comprehension of AI concepts even when they already know a little bit about it. Similarly the literacy level of university students regarding subsidiary factors of AI literacy like 'understanding of AI concepts', 'AI tools and technology', 'AI in everyday life', 'students' perceptions and attitudes towards AI', 'AI education and knowledge', 'risks and challenges of AI', 'access to AI resources and supports', 'Awareness of AI', 'general understanding of AI' and 'AI uses and exposure' was at medium level. Therefore, findings reveal that there is a dire need to sensitize the students regarding all aforementioned factors.

Hence, universities in the developeing countries like Pakistan should incorporate contents about AI into their curricula across disciplines, not just in computer science programs. Moreover, universities may conduct workshops for students to enhance their understanding of AI tools, biases, and real-world applications Partner with industry professionals for hands-on AI experience. Moreoever, universities should organize AI awareness campaigns to educate students about AI's impact on different sectors.

References

Aithal, P. S., & Maiya, A. K. (2023). Innovations in higher education industry–Shaping the future. *International Journal of Case Studies in Business, IT, and Education (IJCSBE)*, *7*(4), 283-311. https://doi.org/10.5281/zenodo.10396770

Celik, I. (2023). Exploring the determinants of artificial intelligence (Ai) literacy: Digital divide, computational thinking, cognitive absorption. *Telematics and Informatics*, *83*, 102026. https://doi.org/10.1016/j.tele.2023.102026

Černý, M. (2024). University students' conceptualisation of AI literacy: Theory and empirical evidence. *Social Sciences*, *13*(3), 129. 10.3390/socsci13030129

Chatterjee, S., & Bhattacharjee, K. K. (2020). Adoption of artificial intelligence in higher education: A quantitative analysis using structural equation modelling. *Education and information technologies*, *25*, 3443-3463.

Dai, C.-P., & Ke, F. (2022). Educational applications of artificial intelligence in simulation-based learning: A systematic mapping review. *Computers and Education: Artificial Intelligence*, *3*, 100087.

Ediyanto, E., Sunandar, A., Ramadhani, R. S., & Aqilah, T. S. (2022). Sustainable instrument development in educational research. *Discourse and Communication for Sustainable Education*, *13*(1), 37-47.

Khan, A. A., Badshah, S., Liang, P., Waseem, M., Khan, B., Ahmad, A., Fahmideh, M., Niazi, M., & Akbar, M. A. (2022). Ethics of AI: A systematic literature review of principles and challenges. Proceedings of the 26th international conference on evaluation and assessment in software engineering,

Kong, S. C., Korte, S.-M., & Cheung, W. M.-Y. (2023). Nurturing Artificial Intelligence Literacy in Students with Diverse Cultural Backgrounds. International Conference on Innovative Technologies and Learning,

Korteling, J., van de Boer-Visschedijk, G. C., Blankendaal, R. A., Boonekamp, R. C., & Eikelboom, A. R. (2021). Human-versus artificial intelligence. *Frontiers in artificial intelligence*, *4*, 622364.

Leavy, P. (2022). *Research design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*. Guilford publications.

Littman, M. L., Ajunwa, I., Berger, G., Boutilier, C., Currie, M., Doshi-Velez, F., Hadfield, G., Horowitz, M. C., Isbell, C., & Kitano, H. (2022). Gathering strength, gathering storms: The one hundred year study on artificial intelligence (AI100) 2021 study panel report. *arXiv preprint arXiv:2210.15767*.

Lohr, S. L. (2021). *Sampling: design and analysis*. Chapman and Hall/CRC.

Long, D., & Magerko, B. (2020). What is AI literacy? Competencies and design considerations. Proceedings of the 2020 CHI conference on human factors in computing systems,

Maghsudi, S., Lan, A., Xu, J., & van Der Schaar, M. (2021). Personalized education in the artificial intelligence era: what to expect next. *IEEE Signal Processing Magazine*, *38*(3), 37-50.

Male, H., Timu, T. M., & Sabrina, D. (2025). The role of artificial intelligence (ai) in essay writing. *Sigeh elt: Journal of Literature and Linguistics*, *5*(1), 476-493.

Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, *2*, 100041.

Pedro, F., Subosa, M., Rivas, A., & Valverde, P. (2019). Artificial intelligence in education: Challenges and opportunities for sustainable development.

Rahman, M. M., Tabash, M. I., Salamzadeh, A., Abduli, S., & Rahaman, M. S. (2022). Sampling techniques (probability) for quantitative social science researchers: a conceptual guidelines with examples. *Seeu Review*, *17*(1), 42-51.

Saxena, M. K., & Bajotra, V. (2024). Potential of Artificial Intelligence in Education and Ethical Issues. *Far Western Journal of Education*, *1*(1), 1-18.

Singh, E., Vasishta, P., & Singla, A. (2025). AI-enhanced education: exploring the impact of AI literacy on generation Z's academic performance in Northern India. *Quality Assurance in Education*, *33*(2), 185-202.

Tapalova, O., & Zhiyenbayeva, N. (2022). Artificial intelligence in education: AIEd for personalised learning pathways. *Electronic Journal of e-Learning*, *20*(5), 639-653.

Timotheou, S., Miliou, O., Dimitriadis, Y., Sobrino, S. V., Giannoutsou, N., Cachia, R., Monés, A. M., & Ioannou, A. (2023). Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review. *Education and information technologies*, *28*(6), 6695-6726.

Tinmaz, H., Lee, Y.-T., Fanea-Ivanovici, M., & Baber, H. (2022). A systematic review on digital literacy. *Smart Learning Environments*, *9*(1), 21.

Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., Felländer, A., Langhans, S. D., Tegmark, M., & Fuso Nerini, F. (2020). The role of artificial intelligence in achieving the Sustainable Development Goals. *Nature communications*, *11*(1), 233.

Weller, M. (2022). *Metaphors of ed tech*. Athabasca University Press.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–where are the educators? *International journal of educational technology in higher education*, *16*(1), 1-27. https://doi.org/10.1186/s41239-019-0171-0