



RESEARCH PAPER

The Dynamics of AI Tools: Analyzing the Impact on University Students' Experiences and Learning Outcomes

¹Ume-Roman and ²Isma Anum and ³Humaira Zia

1. Undergraduate Scholar, Department Media and Communication Studies, National University of Modern Languages, Islamabad, Pakistan.
2. Lecturer, Department Media and Communication Studies, National University of Modern Languages, Islamabad, Pakistan.
3. MS Scholar, Department Media and Communication Studies, International Islamic University, Islamabad, Pakistan.

*Corresponding Author | umeroman87@gmail.com

ABSTRACT

The emergence of Artificial Intelligence (AI) has revolutionized the education system by offering new technologies that improve educational process. This study explores the impacts of AI on the experiences and learning outcomes of the university students. The study has three main objectives: the evaluation of the effects of AI use on students learning outcomes; their experiences with AI; and the comparison of their experiences with those without AI. 366 undergraduate students from three HEC-recognized universities in Islamabad- the National University of Modern Languages (NUML), Quaid-e-Azam University (QAU), and International Islamic University (IIU) - were involved in the quantitative data collection process. However, a considerable positive connection was found between AI integration and students' learning experiences. Higher academic achievements, more individualized learning experiences, and enhanced engagement were reported by students who use AI. Additionally, AI solution can offer instant feedback, sophisticated learning pathways, and tailored recommendations that are streamline with each individual learning preferences and tendencies. The results highlighted the breakthrough potentials of AI in educational settings. It demonstrates that its implementation can boost students' interaction and academic performance considerably. Due to its adaptive and tailored suggestions along with instant feedbacks, AI tools such as ChatGPT, chatbots, Grammarly and Google AI are increasingly employed for learning. Thus, in order to enhance students' learning experiences and academic performance, and pave the way for future advancement in education, the responsible use of AI should be encouraged by incorporating AI into universities curricula.

KEYWORDS

Artificial Intelligence, University Students, Learning Experiences, Learning Outcomes

Introduction

The introduction of Artificial Intelligence (AI) in the modern university setting can be considered as one of the primary driving forces that has created systemic relationship between learning process and academic success. A learning experience is any curricular and educational practice and activity in which the individuals have the chances to acquire new skills, knowledge, attitudes and values. Nevertheless, learning is more likely to be an academic activity carried out by students than it is an outcome delivered by teacher as an instruction (Zerihun, Beishuizen, & Os, 2012). Similarly, the learning outcomes paradigm has become the most extensively used framework for depicting students learning.

However, it stresses the students' capacity to demonstrate the achievements of specific academic goals. With the emergence of AI, numerous domains of human lives have changed, and academia is no exception (Jamal, Gorli, Pattanaik, Chinmay, & Jaisai, 2023). AI has developed gradually into Intelligent Tutoring System (ITS), and is currently used extensively in educational fields (Nwana, 1999). Moreover, researches, on the integration of AI into educational settings, have comprehensively studied a range of AI applications in classrooms, and revealed the benefits they might offer in learning process (Chan & Tsi, 2023). Studies have also revealed that incorporating these emerging technologies has provided favorable benefits for educational practice (Neo et al., 2022). Based on the research conducted by Gaglo, Degboe, Kossingou & Ouya (2021), AI can drastically revolutionize the academic world. Early education is the foundation of academic development, and gadgets are already being emerged to improve students' learning experience (Chen, Chen, & Lin, 2020). On the same note, a realistic use case is the application of chatbots as learning tools during teaching sessions or classrooms. Thus, using in traditional and primary classrooms or not, AI applications have quickly become part and parcel of higher education.

According to the recent poll of university researchers, more than one-third of the students reported using AI, specially for assignment writing to complete their tasks instantly and effectively (Frith & H, 2023). Another research conducted by Brown, Hicks, & Burch (2021) found that learning outcomes can be improved by using mixed-reality tools such as augmented, virtual, and adaptive learning tools. These AI tools will provide clarifications of concepts, answer to difficult questions, and help with solving various difficulties. Furthermore, an Intelligent Tutoring System (ITS), a basic component of AI, is dynamically adapts to learners' progress. It provides targeted support when students find challenges. It results in a more personalized and effective learning experience.

On the contrary to this, many challenges impede the integration of AI into educational sectors. These challenges include ethical consideration, privacy, biasedness, and socio-economic position of the students. However, an in-depth understanding of technology and the learning environment is direly required to successfully ensure the integration of AI into the classrooms (Torres, Manuel, Garcia, Rebeca, & Costa, 2020). Nevertheless, AI has been highlighted to play a crucial role in personalized learning (Chin & Lin, 2020). Moreover, empirical research demonstrates that AI technology considerably affect the efficacy of learning and teaching (Han & Lim, 2020). This adaptability helps ensure that students are exposed to both essential and challenging information, thereby improving their learning outcomes. It has, on the other side, boosted students' engagements, motivation, and students learning experiences through AI-driven platforms. AI possesses the capacity to provide customized learning encounters, adaptive assessment, research chatbots, and predictive analytics. According to Idroes et.al (2023), AI can change the academic work and has already been employed in domains such as personalized learning and adaptive assessment. Therefore, the integration of AI-driven, interactive and advanced learning environment has become an undeniable priority of the academia.

In this research, the dynamics of AI tools are evaluated in terms of influencing the university students' learning experiences, processes, performance and outcomes. It will help the researchers in understanding the integration of AI technology in the academic settings to attain educational success. As a matter of fact, the objectives of this research are twofold: first, how are students' experiences and learning outcomes influences by the usage of AI tools? Secondly, to examine the differences in the learning experience of students with or without the usage of AI tools. To address these problems holistically, the study has adopted a quantitative method. Researcher has used survey as an instrument for data collection. The data were collected from the undergraduate students of three Pakistani

universities who have been exposed to AI techniques. Additionally, this study draws on constructivist theory to expound on the relationship between AI-driven learning students' learning experiences, and their academic success.

Similarly, this study investigates whether or not using AI tools improves university students' educational experiences. This research aims to determine the connection between AI use and academic performance. The researcher also seeks to explore the impacts of AI on students' learning experience. This paper offers a quick review of the challenges of AI and education with a specific focus students' learning process.

Literature Review

Conceptual Framework

The conceptual framework for the study "The Dynamics of AI Tools: Analyzing the Impacts on University Students' Experiences and Learning Outcomes" is established to highlight the intricate interplay of the basic concepts in the contemporary academic context. The framework is primarily constructed to incorporate the various relationships among AI tools' usage, students' experiences, learning outcomes, and the contextual elements that influence AI adoption.

Usage of AI Tools in Education Settings

The invention of robots is widely recognized as the spark for the emergence of Artificial Intelligence (Hamet & Tremblay, 2017). Since the middle of the 20th century, scholars have carefully started the study of the potential applications AI across various fields of study.

The changes in the use of AI have occurred swiftly over the past decades (Grassini, 2023). The application of AI in academic settings is a trend in most parts of the world. Pushed by technological advancement, the use of AI in educational sector has been increasing day by day. The most potent of these tools is obviously AI (Grassini, 2023). AI integration into learning system has emerged as a major global trend, and its application in academia has developed dramatically in recent years. The usage of AI in the realm of education has witnessed a notable surge; it further extends the conventional conception of AI as supercomputers. This revolutionary shift underscores the persuasive and advancing application of AI in a modern academic context (Chen, Zou,, Xie, Cheng, & Liu, 2022). The very future of higher education system is strongly associated with advances in new technologies, and the computing capabilities of developing intelligent machines technologies (Popenici, Rudolph, Tan, & Tan, 2023).

AI, which include natural learning process and automated learning, is now widely used in educational settings across the globe. Student are continually in search of effective strategies to get considerable learning outcomes. In turn, students utilize AI technology to explore various formulation of concepts in order to grasp how well organized and coherently represent their ideas (Grassini, 2023). It offers several applications, from automated administrative work to personalized learning experiences. This involves customized instructions tailored to a student's needs and learning preferences. It has been made possible and facilitated by the emergence of an adaptive e-learning system. Furthermore, an adaptive learning system is continuously improved when new AI techniques are introduced and added to it. According to Gligorea, Cioca, Oancea, & Groski (2023), these systems can recognize patterns in students' data, identify areas of strength and weakness, and also offer tailored suggestions and solutions.

Similarly, the chatbot, according to Winkler & Soellner (2018), has distinguished potential to offer more individualized learning experiences. It also boosts students' engagements, and help them to manage their time more efficient and effectively. A study by VanLEHN (2011) demonstrated that AI-driven adaptive learning can improve students' academic achievements by providing a streamlined and learner-tailored learning experience. Moreover, Natural Language Processing (NLP) applications in AI, stated by Kovanovic (2015), provide comprehensive feedback on students' written assignments. Additionally, AI can create immersive learning environments through Virtual Reality (VR) and Augmented Reality (AR) in order to deepen the understanding of complex topics (Dalgarno & Lee, 2010).

Learning Experiences in AI-Powered Systems

A learning experience can be defined as the gaining of knowledge and the growth of self-confidence. This educational system emphasizes experiential learning, which enables students to understand intricate relationships among academic disciplines. According to Tiwari (2023), the adoption of AI and machine learning in academia enables the personalization and enhancement of students' educational experience. According to scholarly studies, artificial intelligence (AI) applications play a pivotal role in personalizing the learning process by dynamically changing the pace and content to meet each learner's needs (Johnson, 2019). This is because it ensures a more personalized approach, enabling it to optimize students' engagement and accommodate distinguished learning styles (Dabbagh & Kitsantas, 2012).

To support this assertion, AI can boost the learning process because both are versatile and can be modified to suit the needs of different students (Johnson, 2019). These tools provide quick feedback. It helps in creating a more participatory and efficient learning process. Tiwari (2013) argued that timely feedback fosters self-directed learning and enhances subject knowledge. According to Venkatesh, Morris, Davis, and Davis (2023), this kind of feedback allows for a more personalized experience. It also maximizes student engagement and accommodates a variety of learning styles. Moreover, the application of AI tools in the educational settings, as demonstrated by the Technology Acceptance Model (Davis, 1989), highlights the need of incorporating students' goals to use the technology, hence changing their learning experience (Venkatesh, Morris, Davis, & Davis, 2023). Additionally, AI-based cognitive tutoring programs offer guidance that is appropriate for students' cognitive profiles (VanLEHN, 2011). These technologies are important to personal learning styles because they give personalized instructions and feedback that promote knowledge retention and memorization. When these factors come together, students' experiences in all disciplines and classrooms become more balanced, effective, and fulfilling.

Learning Outcomes in AI-Powered Systems

A learning outcome is a clear, observable statement that articulates what a learner knows, understands, or can do upon completion of a certain educational program, course, or learning experience. An assertion that describes what a student or learner should be aware of, comprehend, or be able at the end of a given educational program, course, or learning experience. They serve as the indicators of the efficacy of an educational process or program. Many academic researchers have revealed a correlation between AI usage and advanced academic performance. Technology makes students' learning more compelling. Teachers may also construct exciting adaptive classrooms. Artificial intelligence in education helps teachers adjust lesson plans to the needs of varied learners. Which, in return, ultimately boosts student engagement and academic performance. Artificial

intelligence has revolutionized higher education, changing how instructors and students teach and learn (Rizvi, 2023).

Additionally, interactive problem-solving simulation and adaptive problems are common on AI-powered learning platforms. These capabilities stimulate critical thinking and problem-solving. In accordance with the experiment by Richter O.Z., Marin, Bond & Gouverneur (2019), AI-oriented learning settings can be used to ensure that learning paths are suitable to specific development level and progress. This personalized method ensures that students obtain knowledge suited to their needs, hence maximizing learning (VanLEHN, 2011).

Furthermore, AI is commonly employed to improve students' engagement and interest due to its tailored and flexible nature. AI technology may change content to suit the varied interests and learning styles of various students. It makes the learning environment considerably more exciting and challenging (Hattie & Timperley, 2007). Hattie & Timperley (2007) also claims that AI's adaptability pushes learners to be more engaged and motivated. AI-based learning experiences often contain features that help the acquisition of 21st-century abilities, such as cooperation, communication, and digital literacy (McKenny, Kali, Voogt & Markauskaite, 2015). Students who have been exposed to AI technology are prepared for the dynamic needs of the contemporary job market. AI-infused learning experiences assist learners build competencies that are aligned to the needs of the 21st century. Thus, it is indispensable to note that discipline is dynamic, and current studies will continue refine the understanding of the intricate ways by which AI may influence learning outcomes.

Although previous researches have explored the effects of AI use on students' experiences and performance, yet, they lack a wholesome investigation of the demotions of academic success related to AI interventions. Furthermore, there is still a dearth of empirical studies comparing students' learning experiences with and without AI. Hence, this research gap underlines the need for an integrated study that captures the long-term, undetected effects of AI on students' learning process, outcomes, and performance.

H: Students exhibit a positive learning experience with AI as opposed to those without AI.

Theoretical Framework

Technology Acceptance Model (TAM) was introduced by Fred Davis in 1980s. TAM aims to explain and predict how consumers or users adapt and accept new information technology tools based on their perceptions of the values of the technologies and the ease of use. Nevertheless, Tam does not examine the impacts of AI on students' experiences and outcomes, its concepts are more applicable to the situations and circumstances. Davis (1989) argued that TAM provides a systemic framework for examining the factors that influence students' acceptance of AI tools. TAM involves how people see technology as useful and easy to use, which further shapes their impressions of its adoption and acceptance. This model, as a matter of fact, maintains that the factors such as ease of use and purposefulness primarily impact individuals' attitude and behavioral intentions while embracing new technology. Learners' engagement with the AI tools is mainly dependent on the ease of use of AI applications and their enhanced benefits for them. Such theoretical framework allows a subtle examination of the psychological depths of the decision-making processes of the students in terms of their adoption of AI with regard their academic life (Davis, 1989). As a result, the Tam framework provides a comprehensive understanding of the factors that influence students' adoption of AI, consequently, the impacts of these technologies on their personal lives and academic accomplishments. Thus, this theoretical

background offers helpful insight into the evolving technological landscape in the education sector. It also acts as a guiding principle for deciphering the intricate dynamics of AI integration in higher education (Davis, 1989).

Material and Methods

This research was designed to investigate the connection between the major constructs (AI usage, students' experiences and learning outcomes) through the methodology of survey.

Research Design

The National University of Modern Languages (NUML), Quaid-e-Azam University (QAU), and International Islamic University (IIU) were the three Pakistani universities where the impacts of AI on students' experiences and learning outcomes were investigated through a quantitative methodology. A survey approach was used for data collection at a specific point in time to evaluate the integration of AI in educational settings.

Target Population

Undergraduate students from National University of Modern Languages (NUML), Quaid-e-Azam University (QAU), and International Islamic University (IIU) made up the study sample. The selection of these universities was predicated on diversity across both academic subjects and students demographics. This diversity had provided a comprehensive picture of the effects of AI across multiple educational contexts and settings.

Sample Size

A sample of 366 undergraduates students were selected for the participation from three well reputed universities. The sample and its size was decided on the basis of practicality, resource availability and to contribute statistically to the result of the study.

Sampling Technique

In order to represent different levels of academics a purposive sampling was employed. Due to their reputation for having a diverse students' population, three universities were carefully selected for this study. The student sample was chosen based on study level (undergraduates) and academic sectors. In order to collect a wide range of experiences and perspectives within the sample, a particular number of students was purposefully selected from each group.

Data Collection Instrument and Design

In this research, structured survey questionnaires served as the primary instrument for collecting primary data. The questionnaire contained elements on AI use, students' experiences and learning outcomes. Likert scales along with closed-ended questions were used for the quantification of responses. The questionnaire was mainly divided into three parts: AI usage, students' experiences, and learning outcomes. Participants were intended to report on their usage of AI tools, their satisfaction level with AI-driven learning process, and the outcomes of their learning. In order to put the result in perspective, demographic data was also collected: this include age, gender and academic specialization.

Instrument Reliability

In this study, SPSS is used to measure the questionnaire's consistency and reliability. Internal consistency is tested via using Cronbach's Alpha to verify the instrument's reliability. Cronbach's Alpha is 0.74. It indicates that the questionnaire items used to examine the constructs explored in the proposed study exhibited moderate-to-high consistency.

Dependent and Independent Variables

Independent Variable: AI Usage

The usage of AI means integrating AI-based technologies and tools into academic sectors. These tools include ChatGPT, chatbots, Grammarly and Google AI. They are used for writing assignments, finding information, and fixing grammatical mistakes. It also indicates how often these tools are used: more than once a day; or not consistently (e.g., once a week or few times per week).

Dependent Variable: Learning Experience

The operationalization of the learning experience is the extent to which the learners feel comfortable with AI technologies and to which their interactive learning is facilitated. Nevertheless, it incorporates the attitude of trust, expertise, and confidence in students towards the use of AI in the educational institutions. Additionally, there will be learning activities that entail evaluation of the students; usage of AI in terms of accessibility, availability, efficiency and time-saving features. Finally, the integration of AI into academic environment will boost students' confidence and productivity as they are directly linked to one another.

Dependent Variable: Learning Outcomes

Learning outcomes are the educational achievements or accomplishments, and the benefits of integrating AI tools in the learning process. These include study efficiency, improved learning outcomes, the development of practical and analytical skills and improvements in work quality. However, the significant influence on memory retention will be maintained.

Results and Discussion

The use of regression analysis is proposed in table 1, which aims to evaluate the connection between the usage of AI and students' learning experiences in the educational settings. The investigation finds that the beta coefficient for the impacts of AI on learning experiences is 0.775: it shows a strong positive relationships between the two. Furthermore, the beta coefficient is statistically significant ($p=0.002$). This results shows a strong and positive correlation between the two variables. It also suggests that students' learning experiences can be improved with the inclusion of more AI technologies into education sectors.

Table 1
Influence of AI usage on students' learning experiences

Variable	Beta	Significance (p-value)	N
Learning experience	.755	.002	366

Table 2 displays the findings of the regression study that investigates the impacts of AI use on students' learning outcomes. The results demonstrated a considerable connection, with a beta coefficient of 0.671 and a P-value of 0.01. This shows a highly positive correlation between AI use and students' learning outcomes. It suggests that integrating AI technologies into learning practices will improve students' academic accomplishments.

Table 2
Influence of AI usage on students' learning outcomes

Variable	Beta	Significance (p-value)	N
Learning outcome	.671	.01	366

Table 3 shows the result of a paired sample T-test in which compares students' learning experiences with and without AI. The results reveal a significant and considerable variation in learning experiences between the two mentioned variables. Particularly, students using AI reported a mean score of 3.19 in learning experiences; while those who do not use AI score 1.22. Significant differences that is statistically indicated by the analysis of T-value of 4.654 with 647.17 degrees of freedom and P-value of 0.004. This calculation vividly portrays the difference between the using and not using of AI in the educational settings.

Table 3
Learning experience of students with and without AI usage

	N	Std. Mea.	Std. Deviation	T	Df	Sig. (2-tailed)
Learning Experience with AI	366	3.19	0.344			
Learning Experience without AI	366	1.22	0.311	4.654	647.17	.004

Discussion

The application of Artificial Intelligence (AI) in the educational institutes has attracted a lot of excitement because of its ability to increase experiences and learning performance of students. The students of National University of Modern Languages (NUML), Quaid-e-Azam University (QAU), and International Islamic University (IIU) were the participants of this study. This study examined how AI affects university students' experiences and learning outcomes. Chen, Zou, Xie, Cheng, & Lie (2019) studied how artificial intelligence can be applied in the education sector to promote learning. Through the integration of their findings with this study, the researcher will be able to evaluate the efficiency of AI interventions in boosting engagements among students, personal learning process, and academic achievements across different fields. AI solutions have proved to facilitate learning processes by provision of a tailored recommendation, adaptive learning paths, and real-time learning feedback to the learners (Gao & Liu, 2023). AI-based tutoring software and educational platforms make it possible to provide students with individualized learning content and interventions based on their learning requirements and preferences. Furthermore, the results of this study shows a substantial correlation between students' learning outcomes, learning experiences, and the application of AI. The application of AI tools in academic assignments boosted the learning experience of students, leading to the growth of engagement, efficiency, and trust in the AI technology. Additionally, the use of AI in education led to better learning, including increased analytical skills, practical skills acquisition, and high-quality output.

Conclusion

The strong effect that Artificial Intelligence (AI) had on the experiences and learning outcomes of the university students is explored in this research via a quantitative methodology. The study was carried out at three universities in Pakistan. This research, interrogated 366 students from different background, reveals considerable links between AI integration, learning experiences and learning outcomes. The research demonstrates that this substantial link between them leads to enhanced engagement and students' satisfaction who are studying across various academic fields. The usage of AI-driven tools, such as ChatGPT, chatbots, Google AI, and Grammarly by student in adaptive learning, ready-made suggestions, and real-time evaluation and feedbacks in their academic achievements, is on its peak. Nevertheless, learning institutions in Pakistan must learn about the relevance of using Ai tools in educational process. It will make students skilled and their academic results will improve substantially. With the responsible use of AI, their experience and learning outcomes can be enhanced to a significant point, which will further contribute to inclusivity and creating the basis for future academic success.

Recommendations

- AI tools should be incorporated in the curriculum of various academic discipline in order to introduce students to the positive use of AI technology and raise their digital literacy.
- Students should be encouraged to the ethical and responsible use of AI to learn the challenges, biasedness, digital ethics and the algorithm of privacy.
- Faculty should be trained enough to incorporate AI tools in instructional and educational activities in order to provide interesting and tailored educational experiences.

Future Suggestions

- The sample of this study which include 366 participants from three universities may limit the generalizability of the findings to the broader population of the students.
- Reliance on self-reported may lead to the biasedness and inaccuracy of the responses from the participants.
- The contextual aspect may affect the study findings. These aspects include socio-economic background, availability of the technology, and institutional which are not adequately covered in this research.
- Future researchers can also conduct longitudinal studies. Through which they can forecast long-term results and connections of AI, learning experiences and learning outcomes. This may also give an indication of whether do they work collectively in long term or not.
- One of the limitation of this study is that it is restricted to only three universities. Nevertheless it can be expanded to various fields and background in future.
- The ethical sides of AI use in education such as data security, privacy, transparency and algorithm can also be the priority of the future studies.

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