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AI-Driven Tools as Predicator of Students' Academic Performance at University Level

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ABSTRACT

This study investigates the role of AI-driven tools as predictors of students' academic performance at the university level. The objectives of the study were: (1) to analyze the level of AI tools usage among university students; (2) to determine the relationship between AI tools usage and academic performance; and (3) to explore gender differences in AI tools usage and academic performance, including its sub-dimensions. The population of the study comprised 119 graduate students from the Departments of English (n = 35), Computer Science (n = 25), and Education (n = 59). A census sampling technique was employed. The study adopted a descriptive, quantitative research design, and data were collected using a survey method. Two questionnaires were developed for data collection: one measuring AI tools usage consisting of 20 items, and the other measuring academic performance comprising three dimensions time management (8 items), class participation (7 items), and communication skills (5 items). Both instruments were based on a five-point Likert scale. Content validity was ensured through expert review, and reliability was established using Cronbach's alpha. Data were collected through personal visits after obtaining formal approval from the university authorities. Descriptive statistics (mean scores) were used to analyze AI tools usage, while regression analysis was employed to examine the relationship between AI tools usage and academic performance. An independent samples t-test was used to explore gender differences in AI tools usage and academic performance, including its sub-dimensions. The results revealed a statistically significant and positive relationship between AI tools usage and academic performance. Female students constituted a larger proportion of AI tool users than male students. The study recommends that each academic department develop a structured plan for the effective integration of AI tools into teaching and learning. Although AI has strong potential to enhance student outcomes, ethical considerations and appropriate human oversight remain essential for its effective and equitable implementation in higher education.

Keywords: *Artificial Intelligence, Educational Technology, Instructional Methods, Academic Performance, Higher Education*

INTRODUCTION

Artificial intelligence (AI) is utilized across a broad spectrum of applications and software for language analysis, learning, planning, and problem solving. Its integration has become essential in various technology industries, especially in education. The advancement of AI is transforming education, enhancing the skills necessary for success in both classrooms and workplaces. AI in

education has emerged as an interdisciplinary field, bridging technology and instructional methods (Díaz & Lim et al., 2022). New technologies are constantly changing how we educate, and higher education institutions (HEIs) are expected to increasingly adopt Artificial Intelligence in Education (AI Ed). This change could greatly improve teaching and learning However, using AI Ed technologies may come with challenges, such as high costs, difficulty in scaling), and worries about data privacy Despite these issues, AI Ed also offers opportunities to improve how HEIs operate and educate (Underwood & Luckin, 2011).

Artificial Intelligence (AI) used to be something you'd only hear about in sci-fi, but now it's part of everyday life. Its changing industries like healthcare, transport, shopping, and finance, making things work faster and smarter. The Malaysian Education Blueprint (PPPM) 2013-2025, under Shift 7: Leverage ICT to Scale up Quality Learning across Malaysia, aims to optimize the use of ICT for self-directed learning and broaden access to high-quality education (Ministry of Education Malaysia, 2013). Additionally, the ICT Transformation Plan (2019-2023) by the Ministry of Education supports the goals of PPPM by setting targets for an innovative, dynamic, and high-performing workforce, (Rahimi & Oh 2024).

Academic performance denotes to how well a student achieves their instructive objectives, classically stately through grades, test scores, and overall success in their Schoolwork. It encompasses various aspects, such as completing assignments and homework, actively participating in class, and showing progress over time. Good academic performance often leads to better future opportunities, such as higher education and job prospects. It also contributes to personal growth, boosting self- confidence and developing important skills like critical thinking and problem-solving. Educators assess academic performance using report cards, standardized tests, and teacher evaluations, aiming to help students improve and succeed in their studies (Perkash & Shaheen et al. 2024)

It shows how well a student can use their knowledge to meet their learning needs and achieve their academic goals describe students' performance as how well they complete academic tasks at school or college. Traditionally, it measures how much knowledge, skills, and abilities students have gained added that academic performance should also include behaviors like independently learning and understanding general ideas(Villar & de Andrade 2024) It's important to focus on students' academic performance before university because it sets the foundation for their success in higher education and other areas. For example, getting into colleges and universities requires high academic achievement in pre-university programs. Colleges often look at high school grades and standardized test scores during the admission process. Students also need to be well-prepared because college courses are usually more challenging than high school ones (Emmanuel, 2024).

Statement of the Problem

Artificial Intelligence (AI) has emerged as a transformative force in education, offering enhanced efficiency, personalized learning, and predictive analytics in academic settings. While substantial research exists on AI's role in predicting student performance at the global level, and to a limited extent in Pakistan, there remains a critical gap in understanding its applicability within the higher education institutions of Azad Jammu and Kashmir (AJK).This study seeks to investigate the efficacy of AI- driven tools in forecasting academic performance among university students in AJK. The region's diverse socio-academic context demands an examination of whether AI- based predictive models can be effectively adapted to local educational frameworks. By addressing this gap, the research aims to contribute empirical evidence to the field of educational technology, assessing AI's potential to enhance learning outcomes and support data-driven decision-making in AJK's higher education system. The findings will provide valuable insights for policymakers, educators, and administrators in assimilating AI solutions to improve academic success in the region.

Objective of the study

1. To find the usage of AI-driven tools among university level.

2. To find the relationship of AI-driven with students' academic performance.

3. To find the difference regarding AI-driven tools and student academic performance based on gender.

Null Hypotheses

H_o1. There is no significant difference among students regarding usage of AI-driven tools.

H_o2. There is no relationship of AI-driven tools with student's academic performance

H_o3. There is no difference in AI-driven tools and students' academic performance based on gender.

LITERATURE REVIEW

Artificial Intelligence

Artificial Intelligence (AI) has distorted various sectors, including education, by offering advanced tools to predict students' academic performance at the university level. These AI-driven attacks use complex algorithms to analyze extensive data on students' learning behaviors, assignation levels, and past academic records. (Ayeni & Al Hamad et al., 2024)**.** The use of AI in education brings numerous advantages. It enables the customization of learning experiences, ensuring that educational content and support are tailored to individual student needs. This personalized approach helps address specific learning gaps and enhances overall academic performance. Furthermore, Understanding the role and impact (Shoaib & Sayed et al., 2024) Artificial Intelligence (AI) is changing education by bringing in new ways of teaching and learning. (Kaswan & Dhatterwal et al. 2024).

AI-driven tools in Education

AI-driven tools provides students the flexibility to select where they want to study and when and these tools helps in monitoring group's discussion and guide and support the students learning engagement. (Ullah & Asghar et al., 2024). AI tools can accurately map personalized learning plans, providing students weakness, strengths, and activities, and learning preferences. Algorithms guided students along with customized learning paths offers deep personalized learning experiences. The usage of artificial intelligence has introduced the predictive and diagnostic solutions that beat the traditional process and options. Through the data analysis of artificial intelligence can proactively identify the learning difficulties of the students and in offer solutions to these difficulties to prevent the academic failure and dropout consequences. (Wongmahesak & Karim et al., 2025).

AI-driven tools and Student Learning

AI-driven tools enables teachers to identify students' learning preferences, strengths, and abilities, allowing them to create lessons tailored to each individual's needs. Additionally, AI assists in monitoring student progress and refining teaching strategies accordingly. The primary goal of incorporating AI in education is to enhance student-centered learning while offering personalized instructional support. (Ma & Lei 2024).

TYPES OF AI-DRIVEN TOOLS

Artificial intelligence (AI) can be categorized into different types based on its complexity and

functionality. The most fundamental type is Reactive Machines, which operate solely on real-time data, responding to present scenarios without the ability to learn from past experiences or retain memory.(Rasmussen 1986 & Mei, Zhu et al., 2024) A step ahead are Limited Memory AI systems, which can use information from past experiences to make better decisions in the present. A practical example is self- driving cars, which observe their surroundings and use that information to navigate safely and efficiently.

Benefits of AI-driven Tools

Artificial Intelligence (AI) is playing an increasingly important role in modern education by creation learning more personalized, efficient, and accessible. One of the most significant benefits is personalization. AI tools can adapt to each student's learning style, pace, and level of understanding, offering tailored lessons and practice exercises (Stork & Walker et al., 2025). Efficiency is another key advantage. AI systems can automate time-consuming tasks such as grading, scheduling, and tracking student progress, allowing teachers to focus more on teaching and student engagement (Sajja & Sermet et al. 2024).

Related studies of Artificial Intelligence

Artificial Intelligence in Education (AIED) has seen remarkable progress over the past quarter-century. (Moon, 2006), we pinpoint the primary focuses and scenarios shaping the AIED field. Based on these insights, we propose two parallel research trajectories for the next 25 years: The first is an evolutionary approach, emphasizing the enhancement of current classroom practices, partnerships with educators, and the expansion of technologies and domains. The second is a revolutionary approach, advocating for the integration of AIED technologies into students' daily lives, thereby supporting their cultures, practices, goals, and communities.(Abbas Khan & Khan et al.,2024). It is reforming how we live and work in this context, higher education is poised to experience significant impacts from AI's potential. Universities and educational institutions are actively exploring the integration of (Pedro, Subosa et al. 2019). The integration of AI in higher education brings a complex array of chances and challenges that require careful consideration and scholarly analysis technologies are driving a paradigm (Tatineni, 2020).

Academic performance

Academic performance denotes to how well a student achieves their instructive objectives, classically stately through grades, test scores, and overall success in their schoolwork. It encompasses various aspects, such as completing assignments and homework, actively participating in class, and showing progress over time. Good academic performance often leads to better future opportunities, such as higher education and job prospects. It also contributes to personal growth, boosting self- confidence and developing important skills like critical thinking and problem-solving. Educators assess academic performance using report cards, standardized tests, and teacher evaluations, aiming to help students improve and succeed in their studies (Perkash & Shaheen et al. ,2024). Good academic performance plays a crucial role in shaping a student's future by opening up valuable opportunities and building essential life skills. One of the most significant benefits of strong academic achievement is access to future opportunities. High performing students are more likely to gain admission into prestigious higher education institutions, qualify for scholarships, and receive offers for desirable employment positions (Tariq et al., 2022).

Academic Performance Theory

Academic Performance Theory seeks to explain the various factors and processes that influence students' achievement in educational settings. This theory integrates psychological, social, and

environmental perspectives to provide a comprehensive understanding of what drives academic success. At its core, Academic Performance Theory suggests that student achievement is not determined by a single factor but by the interaction of multiple variables. These include cognitive abilities, motivation, learning environment, socioeconomic background, teaching quality, and emotional well-being (Pintrich & De Groot, 1990; Schunk & DiBenedetto, 2020). For example, cognitive factors such as memory, attention, and critical thinking skills form the basis for acquiring and processing knowledge. However, cognitive abilities alone do not guarantee academic success unless they are paired with strong motivation and self-regulation (Zimmerman, 2002). Motivation is a central component in this theory, often divided into intrinsic motivation learning for personal satisfaction and extrinsic motivation learning driven by external rewards or pressures (Deci & Ryan, 1985).

Key Elements of Academic Performance Theory

Motivation plays a crucial role in shaping students' academic success. It reflects an internal drive to excel in educational tasks, influenced by personal aspirations, interest in the subject, or external factors such as recognition and grades. Studies indicate that motivated students are more likely to exert effort and demonstrate persistence in their studies, leading to improved academic performance (Hassan, 2024). In addition to motivation, cognitive abilities including memory, attention, and problem-solving skills are essential for effective learning. Students with strong cognitive capabilities can better process and retain information, contributing to enhanced academic achievement (Hassan, 2024).

Applications of Academic Performance Theory

Academic Performance Theory is important for developing effective educational policies. These policies can help create positive learning environments, support students' mental and emotional well-being, and encourage good teaching practices (Revathi & Poonguzhali, 2024). When educators use the theory to design curricula, they can better meet the diverse learning needs of students, which promotes better academic results. Additionally, the theory guides the creation of student support services such as tutoring, counseling, and mentoring, which help address different challenges that affect student performance (Revathi & Poonguzhali, 2024).

Academic Performance and Academic Self-efficacy

Understanding academic performance theory is important for shaping educational policies that create positive learning environments. These policies help support students' well-being and encourage effective teaching and coaching methods (Revathi & Poonguzhali, 2024). When educators use this theory in curriculum design, they can create courses that meet different students' learning needs and help improve their academic success. Additionally, the theory helps guide the development of student support services such as tutoring, counseling, and mentoring. These services address various challenges that affect how well students perform in school (Revathi & Poonguzhali, 2024).Academic performance theory provides a comprehensive understanding of the multifaceted influences on student achievement. By addressing motivation, cognitive abilities, learning environments, socioeconomic factors, teaching methods, emotional health, and assessment practices, educators and policymakers can better support student success in educational settings(Revathi &Poonguzhali 2024).

Academic Self Efficacy as Predicator of Academic Performance

Academic self-efficacy is the belief that students can successfully complete academic tasks or achieve learning goals It also involves their awareness of their abilities to finish assignments Bandura (1986) noted that (Yu&Zhou et al. 2024). Students with high self-efficacy manage, perform, and solve problems

related to learning tasks confidently, believing they will succeed. They show good behavior, such as submitting assignments on time, not complaining about tasks, and tackling difficult assignments in higher education, students need confidence to adjust well to their academic environment. This confidence, called self-efficacy, is important in Bandura's social cognitive theory (1986). Self-efficacy means trusting in your ability to organize and carry out actions to achieve your (Saks, 2024) with purpose (Kalinowski&Westphal et al., 2024)

Existing Studies on Academic Performance Prediction

Predicting academic performance is essential in online education, as it helps identify students at risk of failure, enables personalized learning pathways, and enhances instructional strategies. Various AI algorithms have been employed to forecast exam outcomes by classifying students or estimating their scores. Machine learning techniques such as Naïve Bayes and k-nearest neighbors have been utilized to determine whether students will "pass" or "fail." Additionally, algorithms have been applied to categorize student performance based on grades, while genetic programming and data extraction methods have been used to predict academic failure (Pelima & Sukmana et al., 2024).

RESEARCH METHODOLOGY

The study used a descriptive research design, which means it focused on observing and describing what was already happening, without trying to change anything. To do this, the researcher used a quantitative method, which is good for working with numbers and facts. This method helps collect data that can be measured and then analyzed using statistics. It was useful for this type of study because it gave clear, number-based results that helped explain the situation being studied.

Population of the study

The population of the current study was graduate students of Mohi-ud-Din Islamic university departments of English, Education, Computer science population was consist of 119 students.

Population of the current study

S/No	Subject	Level MPhil
1	English	35
2	Computer Science	25
3	Education	59
Total		**119**

Sample of the study

The sample size of proposed study will be selected by census sample technique

Sample size of proposed study

Sr/No	Subject	Level MPhil
1	English	35
2	Computer Science	25
3	Education	59
Total		**119**

ANALYSIS AND RESULT

Age wise mean scores comparison of AI Driven tools

Age	N	Mean
25-30	3	3.56
31-35	70	3.78
36 above	46	3.74

The table shows the average scores (mean) for three age groups. The 25-30 age group has 3 individuals, with an average score of 3.56. The 31-35 age group, with 70 individuals, has the highest average score of 3.78, indicating the best performance. The 36 and above age group, consisting of 46 individuals, has an average score of 3.74, which is slightly lower than the 31-35 age group but still quite high. Overall, the 31-35 age group shows the highest average score.

Department wise Mean score comparison of AI Driven tools

Department	**N**	**Mean**
Computer science	50	3.89
English	34	3.77
Education	35	3.56

The table displays the average scores (mean) for three different departments. The Computer Science department, with 50 individuals, has the highest average score of 3.89. The English department, which includes 34 individuals, follows with an average score of 3.77. The Education department, with 35 individuals, has the lowest average score of 3.56. This suggests that the Computer Science department has the highest performance on average.

Gender wise Mean score comparison of Academic performance

Gender	N	Mean
Male	46	3.86
Female	73	3.66

The table shows the average scores (mean) for males and females. The male group, consisting of 46 individuals, has an average score of 3.86, while the female group, with 73 individuals, has a slightly lower average score of 3.66. This indicates that, on average, males scored higher than females.

Age wise mean score comparison of academic performance

Age	**N**	**Mean**
25-30	3	3.00
31-35	70	3.81
36 above	46	3.68

The table shows the average scores (mean) for three age groups. The 25-30 age group, with 3 individuals, has the lowest average score of 3.00. The 31-35 age group, which includes 70 individuals, has the highest average score of 3.81. The 36 and above age group, with 46 individuals, has an average score of 3.68, slightly lower than the 31- 35 group but still high. This indicates that the 31-35 age group performed the best on average.

Department wise mean score comparison of academic performance

Department	N	Mean
Computer science	50	3.71
English	34	4.18
Education	35	3.35

The table presents the average scores (mean) for three departments. The Computer Science department, with 50 individuals, has an average score of 3.71. The English department, consisting of 34 individuals, has the highest average score of 4.18. The Education department, with 35 individuals, has the lowest average score of 3.35. This indicates that, on average, the English department performed the best, while the Education department had the lowest average score.

Relationship between AI Driven Tool and Academic Performance

Regression Analysis

Variable	B	Std Error	Beta	T	R	P	R Square
Academic Performance	.590	.094	.502	6.271	.502[a]	.000	.252

The table grants the results of a regression analysis for Academic Performance. The B value is 0.590, which represents the unstandardized coefficient, representative the strength and direction of the relationship between the predictor variable and academic performance. The Standard Error is 0.094, showing the accuracy of the B value estimate. The Beta coefficient is 0.502, which is the standardized coefficient, indicating a moderate positive relationship between the predictor and academic performance. The T-value is 6.271, which suggests that the predictor is statistically significant, as it is much larger than 2, meaning the relationship between the predictor and academic performance is unlikely to be due to chance. Finally, the R value is 0.502, indicating a moderate positive correlation between the predictor and academic performance.

To find the difference regarding AI-driven tools and student academic performance based on gender

Gender difference in AI usage

Gender	N	Mean	Std.Deviation	Df	T	Sig
Male	46	3.37	1.216	117	.725	.483
Female	73	3.22	1.075			

An independent samples t-test was performed to examine whether there was a statistically significant difference in mean scores between male and female participants. The findings indicated that male participants (N = 46) had an average score of 3.37 with a standard deviation of 1.216, whereas female participants (N = 73) had a slightly lower mean score of 3.22 with a standard deviation of 1.075. The test resulted in a t-value of 0.725 with 117 degrees of freedom and a significance level (p-value) of 0.483. Since this p-value exceeds the conventional threshold of 0.05, it suggests that the observed difference in mean scores is not statistically significant. This implies that the slight variation in averages is likely due to random fluctuations rather than an actual difference between genders. Consequently, the study concludes that there is no meaningful difference in the measured variable

between male and female participants in this sample.

Academic performance

Gender	N	Mean	Std Deviation	Df	T	Sig
Male	46	3.86	.927	117	1.051	.168
Female	73	3.66	1.001			

An independent samples t-test was conducted to determine whether there was a significant difference in mean scores between male and female participants. The results showed that male participants (N = 46) had an average score of 3.86 with a standard deviation of 0.927, while female participants (N = 73) had a slightly lower mean score of 3.66 with a standard deviation of 1.001. Although there was a numerical difference, the t-test indicated that this variation was not statistically significant. The computed t- value was 1.051 with 117 degrees of freedom, and the corresponding p-value was 0.168. Since the p-value exceeds the standard threshold of 0.05, the null hypothesis cannot be rejected. This suggests that the difference in mean scores between male and female participants is likely due to random chance rather than a meaningful or systematic disparity between the collections.

Discussions

The research aims to investigate the role of AI-driven tools in students' academic performance at the university level, focusing on three key objectives. This research thoroughly examines how AI tools impact university students' academic performance by exploring usage patterns, effects on results, and gender differences. It reveals that nearly two-thirds of students have used AI tools in their studies, with female students performing slightly better and representing a slightly larger portion of users (Von Garrel and Mayer, 2023). This highlights the growing importance of AI in modern education. The study also shows a clear positive link between using AI tools and improved academic outcomes, meaning students who engage with these technologies tend to achieve better results (Oyeyemi, Okoye et al., 2024).

Supporting this, similar research from Nigerian universities also found that AI use enhances learning abilities (Oyeyemi, Okoye et al., 2024). Regarding gender, the findings indicate no significant difference between male and female students in academic scores or AI usage rates, suggesting that both genders benefit equally from these tools (Elshaer, Hasanein et al., 2024). Interestingly, male students appear more motivated to use AI tools because they believe it will boost their performance, while female students are less influenced by this expectation (Elshaer, Hasanein et al., 2024). Despite this motivational difference, AI tools contribute positively to academic success for all students. Overall, the study emphasizes that AI tools are vital in creating personalized, effective learning experiences and improving student performance. Universities should continue to support and integrate AI technologies to ensure all students can take full advantage of these benefits.

CONCLUSION

1. It was concluded that middle-aged students show the highest engagement and effectiveness in using AI-driven tools, likely due to greater academic maturity and experience. Older students also demonstrate strong and positive use, with outcomes close to the highest-performing group. In contrast, younger students show relatively lower engagement, though their overall use remains satisfactory. Overall, the findings suggest that age influences the effective utilization of AI-driven tools, with more mature students achieving slightly better outcomes.
2. The results showed that students from technology-oriented disciplines demonstrate

stronger engagement and effectiveness in using AI-driven tools. Computer Science students exhibit the highest level of use, followed by English students, while Education students show comparatively lower but still positive engagement. Overall, the findings suggest that academic discipline influences the effective utilization of AI-driven tools, with greater alignment observed in technology-focused fields.

3. The gender-wise comparison indicates that male students demonstrate slightly higher academic performance than female students. However, the difference is not substantial, suggesting that both genders show generally strong and comparable levels of academic performance. Overall, the findings imply that gender has a limited influence on academic performance in this context.

4. The results indicate that middle-aged students show the highest academic performance, followed closely by older students, while younger students perform comparatively lower. Overall, age appears to influence academic outcomes, with more mature students achieving better results.

5. The department-wise comparison shows that English students demonstrate the highest academic performance, followed by Computer Science students, while Education students show the lowest performance. Overall, academic discipline appears to influence students' academic outcomes, with language-focused fields performing better in this context.

6. It was concluded that moderate positive relationship between the use of AI-driven tools and students' academic performance. The results show that AI-driven tools significantly predict academic outcomes, suggesting that greater engagement with these tools is associated with improved academic performance. Overall, the findings highlight the important role of AI-driven tools in enhancing students' learning and performance at the university level.

7. It was concluded that there is no statistically significant difference in AI usage between male and female students. Although males show a slightly higher average score, the difference is not meaningful, suggesting that both genders use AI tools at similar levels.

8. It was concluded that there is no statistically significant difference in academic performance between male and female students. Although males have a slightly higher average score, the difference is not meaningful, indicating that both genders perform at comparable levels academically.

RECOMMENDATIONS

1. It was recommended that universities may be incorporate AI-driven learning tools into courses to support teaching and learning. For example, using AI-based quizzes, virtual labs, or personalized learning platforms can enhance student engagement and understanding.

2. It was recommended that university may be Offer regular training sessions for both students and faculty on how to effectively use AI tools. This will increase confidence, digital literacy, and the practical application of AI in academic tasks.

3. Universities might be continue providing equal access to AI-driven tools for all students, regardless of gender, as both male and female students are likely to benefit similarly.

4. Teachers may be encourage classroom interactions, group work, and discussions that include

all students equally, fostering collaboration and engagement across genders.

Future Recommendations

1. Incorporate AI-driven tools into more subjects and disciplines to enhance learning experiences.
2. Use AI tools to provide tailored learning paths and support for individual student needs.
3. Offer training programs for students and faculty to improve proficiency in AI tool usage.
4. Examine how continuous use of AI tools affects academic performance over time.

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