



## Exploring the Impact of AI-Powered Social Network Sites on Academic Performance: The Mediating Role of Big Five Personality Traits

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### Abstract:

This study aims at exploring the impact of AI-powered social network sites on academic performance: The mediating role of big five personality traits. It utilized a mixed methods approach, combining qualitative techniques with quantitative analysis to investigate the relationship between Social Network Site usage and the personality traits of secondary school pupils. The study population included 8,617 10<sup>th</sup> grade students in District Attock, comprising 4,868 boys and 3,749 girls, enrolled in 248 public secondary schools. The study sample comprised 530 pupils from the population. The proportional sampling method was utilized for sampling. The sample size of each stratum is directly proportionate to the total population size of that stratum. This signifies that each sample inside every stratum is selected utilizing a consistent sampling percentage. Two unique self-created research instruments were utilized to achieve the study's objectives. Big Five Personality Traits Assessment (BFPTs) The Big Five Personality Tool consists of 39 measures that evaluate five specific traits: Agreeableness, Extraversion, Openness, Conscientiousness, and Neuroticism. Utilization of Social Networking Sites (SNSs) The Social Network Sites tool consists of twenty-nine unique elements related to five essential and commonly used Social Network Sites. The correlation analysis indicates a strong positive association between AI Usage and Academic Performance (AP), evidenced by a moderate positive correlation ( $r = .531$ ,  $p = .000$ ). This suggests that increased AI usage correlates with improved academic achievement, indicating a beneficial effect on learning outcomes. Therefore, it is advisable for educational institutions to include AI tools into the learning environment to improve academic achievement through tailored learning experiences and effective resource management.

**Key Words:** AI-Powered Social Network Sites, Academic Performance, Big Five Personality Traits, Impact Analysis, Mediation Analysis, Mix method Research.



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## Introduction

A social networking site is an interactive platform for verbal exchange, allowing users to create accounts to join a particular network. They typically utilize their personal accounts to maintain connections with their respective persons through social networking sites. Social Network Sites are mostly utilized for communication and have become significant as an efficient method of remote interaction. Their contemporary needs have significantly benefited from the extensive contributions of modern technology (Mahnaz *et al.*, 2022).

Social networking services provide varying features based on users' abilities to disseminate their knowledge, opinions, activities, personal details, emotions, significant events, and areas of interest. Social networking sites present numerous advantages, the most fundamental being the ability to register and establish various profile types, whether public or semi-public, within a connected system that facilitates communication with individuals from diverse regions. Social networking sites have emerged as the most active web-based applications, known as Web 2.0. They enable students to create profiles, facilitating social interaction with peers and providing opportunities for engagement with instructors. The popularity of the social networking site is steadily rising due to its unrestricted access for individuals seeking to engage with educators and peers to generate collective knowledge, irrespective of the prominence of various social networking platforms among users (Mahnaz *et al.*, 2022). Different educational system in Pakistan, the basic variable is the "TEACHER." Teaching is aptly described as an art, wherein the quality of output direct relation to the teacher's contribution in terms of faith, diligence, and dedication. Consequently, it is reasonable to assert that no educational program may exceed the caliber of its instructors (Mehrukh *et al.*, 2022).

The Big Five Personality Traits- Conscientiousness, Agreeableness, Extraversion, Openness, and Neuroticism, represent extensive facets of human personality. These characteristics encompass variations in inventiveness, discipline, friendliness, cooperativeness, and emotional stability. The Big Five Personality Traits are considered a thorough framework for comprehending individual variations. These characteristics affect many behaviors, encompassing social interactions, learning inclinations, and technology uptake. Individuals with high openness typically welcome innovative experiences and technology, whereas those with elevated conscientiousness are more inclined to participate in structured and goal-directed activities, such as academic endeavors. Extraverts frequently demonstrate robust social networking behaviors, employing platforms such as Facebook and WhatsApp for social interaction, whereas pleasant persons display collaborative inclinations, rendering them more amenable to online social relationships. Conversely, neuroticism might result in adverse emotional experiences and dependence on social media for coping, potentially affecting academic performance and mental health (Mahnaz & Kiran, 2024b). According to Wajid Mahnaz and Dr Sidra Kiran (2024), Academic Performance refers to the extent to which a student has successfully attained their educational goals. It is typically measured by grades, test scores, and overall performance in school or academic programs. Academic achievement can also encompass other indicators of success, such as completing assignments, mastering specific skills or subjects, and earning degrees or certifications. It reflects both the level of knowledge and skills a student has acquired and their ability to apply this knowledge in an academic setting.

A substantial number of empirical research have been conducted on student academic motivation and its potential antecedents, including aspects connected to the classroom teacher, contextual elements, and individual student characteristics that promote academic drive. This can be interpreted as a reaction to the numerous empirical studies conducted on student academic motivation (Mahnaz, Mehmood & Umar, 2022). The widespread integration of Facebook and WhatsApp into students' daily routines has raised significant questions about their impact on academic performance, particularly when analyzed through the lens of personality psychology. Secondary school students, who form a significant portion of these platforms' users, experience varying outcomes based on their usage patterns, influenced by underlying personality traits (Mahnaz & Kiran, 2024b). Transitions facilitate the physical and psychological progression of children from one activity to another. Smooth transitions are intended to guarantee that all pupils possess the requisite materials and mindsets for a new activity. Teachers must actively supervise their pupils to sustain an effective learning environment. Classroom management study indicates that active monitoring involves meticulously observing student behavior, intervening to rectify inappropriate actions before they escalate, consistently addressing misconduct, and focusing on student learning (Shaheen *et al.*, 2022).

The integration of SNS into the flipped classroom model presents a unique opportunity to enhance academic achievement. SNS platforms can serve as extensions of the classroom, enabling students to access instructional content, engage in discussions, and collaborate on projects beyond school hours. For example, teachers can use YouTube to deliver lecture videos, Facebook groups for class discussions, and WhatsApp for sharing assignments and providing feedback (Mehnaz *et al.*, 2025). The condition of education in Australian government schools was anticipated to advance, update, and refine teaching competencies and comprehension in each primary subject through the quality teacher program. The subjects comprised Mathematics, Numeracy, Information Technology, Literacy, and Vocational Education (Mahnaz *et al.*, 2023).

### Objectives of the Study

Following were the main objectives of the study.

1. To examine the relationship between AI-powered social network site usage and academic performance.
2. To investigate the correlation between the Big Five personality traits and academic performance.
3. To analyze the mediating role of Big Five personality traits in the relationship between AI-powered social network site usage and academic performance.

### Hypotheses for the Study

**H<sub>1</sub>:** There is a significant relationship between AI-powered social network site usage and academic performance.

**H<sub>2</sub>:** The Big Five personality traits significantly correlate with academic performance.

**H<sub>3</sub>:** The Big Five personality traits mediate the relationship between AI-powered social network site usage and academic performance.

### Significance of the Study

This study is significant for its examination of the intricate relationship among AI usage, Big Five Personality Traits (BFPTs), and Academic Performance (AP), offering essential insights into the impact of contemporary educational tools and personality development on student achievement. The study demonstrates a favorable association between AI usage and academic performance, underscoring the potential of AI tools to improve learning outcomes via individualized educational experiences and effective resource management. This underscores the necessity for educational institutions to implement AI-driven solutions to accommodate various learning requirements and enhance academic performance. The research highlights the significant influence of personality qualities on academic achievement, indicating that individuals exhibiting favorable traits, such as conscientiousness, openness, and agreeableness, generally have superior academic outcomes. The research identifies BFPTs as a crucial mediator between AI usage and academic performance, enhancing the knowledge of how personality development affects the efficacy of AI in education. This discovery enhances the current understanding by connecting technological integration with psychological aspects in academic achievement. The study provides practical implications for educators, policymakers, and academics by emphasizing the significance of a comprehensive educational approach that integrates AI-enhanced learning settings with character development programs. This comprehensive technique can enhance educational outcomes by utilizing AI tools to improve academic achievement and cultivate positive personality qualities. Thus, the study offers a significant framework for formulating effective educational policies and interventions that address the changing requirements of students in the digital era.

### Literature Review

The emergence of AI-driven functionalities in social networking services has transformed the way individuals connect, obtain information, and interact with material. These platforms utilize AI algorithms to customize user experiences, suggest content, and enable social interactions. Despite the multiple advantages these innovations present, apprehensions have arisen concerning their possible effects on users' academic performance, especially among students who extensively utilize these platforms. The Big Five model of personality traits significantly influences individuals' behaviors and their interactions with technology. Comprehending how these features

influence the connection between AI-driven social networking service utilization and academic performance is crucial for formulating measures to alleviate potential adverse consequences and improve good results.

### AI-Powered Social Network Sites and Academic Performance

AI-powered SNSs utilize machine learning algorithms to curate content, suggest connections, and optimize user engagement. Features such as personalized news feeds, targeted advertisements, and adaptive notifications are designed to capture users' attention and encourage prolonged usage. While these features enhance user experience, they may also contribute to increased screen time, distraction, and procrastination, potentially adversely affecting academic performance. Research indicates that excessive use of SNSs can lead to decreased academic achievement due to time displacement and reduced focus on educational tasks. For instance, Wang *et al.* (2023) found that students who spent more time on SNSs had lower grades and reported difficulties in managing their study time effectively. The AI-driven personalization of content may exacerbate this issue by creating echo chambers that reinforce users' existing interests, diverting attention from academic responsibilities.

### The Mediating Role of Big Five Personality Traits

Personality factors can moderate the association between social networking site usage and academic achievement by affecting users' vulnerability to distraction, time management abilities, and content engagement. Studies indicate that conscientious persons are more adept at managing their social networking service usage, thereby reducing its adverse effects on their academic performance (Mammadov, 2021). Conversely, individuals exhibiting high neuroticism may utilize social networking sites as a stress coping method, resulting in compulsive usage behaviors that disrupt scholastic obligations (Wang *et al.*, 2023). A study by Liu and Campbell (2017) examined the relationship between personality traits and social networking site engagement, revealing that extraversion and openness were favorably correlated with social media usage, however conscientiousness exhibited a negative correlation. These findings indicate that specific personality features predispose individuals to varying degrees of SNS activity, potentially affecting their academic success.

### Empirical Evidence and Discussion

A meta-analysis conducted by Mammadov (2021) investigated the correlations between the Big Five personality traits and academic success, aggregating data from 267 separate samples with more than 413,000 participants. The research indicated that conscientiousness exhibited the most robust positive correlation with academic achievement, whereas neuroticism shown a negative association with academic success. Openness to experience demonstrated a positive, though less robust, correlation with academic achievement. Further research by Wang *et al.* (2023) explored the mediating effects of major identity and self-efficacy on the relationship between personality traits and academic performance. The study revealed that conscientiousness positively influenced academic achievement through enhanced self-efficacy and a strong identification with one's academic major. Conversely, neuroticism negatively impacted academic performance by undermining self-efficacy and major identity.

The Big Five Personality Traits provides insights into diverse behavioral tendencies that are essential for understanding digital interactions. For example, extraverts tend to favor interactive platforms like Instagram and Facebook, which cater to their sociable and outgoing nature, whereas conscientious individuals gravitate towards platforms that support goal-oriented activities, such as LinkedIn or educational forums. Conversely, neurotic individuals may use SNS for escapism, often engaging in passive consumption that can hinder productive activities, including academic tasks. These behavioral differences underscore the necessity of studying how personality influences students' engagement with digital tools, especially given the rising integration of technology in educational settings. Moreover, understanding these relationships can guide educators and policymakers in leveraging SNS to enhance learning outcomes and mitigate potential drawbacks (Mahnaz & Kiran, 2024). Umair *et al.* (2022) posited that the employment of ICTs by educators is a substantial predictor of student success, emphasizing a vital association between ICT utilization in the classroom and academic performance. The grades of computer science students fluctuate between 88.18% and 87.80%, with most attaining commendable results. Previous studies on the use of social networking sites in secondary school have shown that these platforms can function as an alternative mode of communication with students, as opposed to traditional face-to-face interactions.

This research seeks to investigate the use of social networking sites during COVID-19 and its effect on the academic performance of secondary-level pupils, particularly in the aftermath of the global pandemic. It concentrates on public educational institutions with minimal Learning Management System (LMS) utilization, where both students and instructors depended exclusively on in-person contact before the COVID-19 pandemic. Throughout the COVID-19 pandemic, numerous technologies were utilized in the educational process (Mehnaz *et al.*, 2022).

### Theoretical Framework

The Uses and Gratifications Theory (UGT) is pertinent for comprehending the influence of WhatsApp and Facebook usage on academic achievement among secondary school pupils. The Uses and Gratifications Theory asserts that individuals deliberately choose media and technology according to their needs and goals, pursuing gratifications such as social contact, information gathering, amusement, or emotional support. This theory helps explain why students use platforms like WhatsApp and Facebook, as they may be motivated by both academic and social needs, such as staying connected with peers, sharing study materials, or participating in academic discussions. In the context of this study, UGT can provide insights into how students use WhatsApp and Facebook for academic purposes, such as group study sessions, access to educational resources, and communication with teachers or classmates. These gratifications, driven by specific needs related to Scholastic Performance, might positively influence scholastic performance. For instance, students who use WhatsApp for collaborative study groups may experience enhanced academic engagement, while those who use Facebook for educational content or group discussions may see improvements in academic performance as well. However, UGT also suggests that excessive use of Facebook for recreational purposes, such as socializing or entertainment, could detract from academic focus, potentially leading to negative impacts on scholastic performance. The theory suggests that students' personalities, as reflected in the Big Five traits, may influence their media choices and usage patterns, with conscientious students more likely to use WhatsApp and Facebook for academic purposes, while others may engage with these platforms for social and emotional needs, which could interfere with their academic goals.

## Method

### Research Design

This study utilized a mixed methods approach, combining qualitative techniques with quantitative analysis, to investigate the relationship between Social Network Site usage and the personality traits of secondary school pupils. The application of a triangulation design in mixed methods research is justified by the intrinsic constraints seen in all research methodologies.

### Population

The study population comprised all 8,617 10<sup>th</sup> grade students in District Attock, consisting of 4,868 boys and 3,749 girls, enrolled in 248 public schools at the secondary level.

### Sample and Sampling Technique

The study sample included 530 students from the population. The Proportional Sampling method was utilized for sampling. The sample size of each stratum is directly proportionate to the total population size of that stratum. This indicates that every sample within each stratum is chosen using a uniform sampling percentage.

### Research Instruments

Two distinct self-developed research instruments were employed to fulfill the study's aims.

#### Research Tool No. 1

**Big Five Personality Traits Tool (BFPTs)** The Big Five Personality Tool comprises 39 items that assess five distinct characteristics, namely the Big Five personality traits: Agreeableness, Extraversion, Openness, Conscientiousness, and Neuroticism.



## Research Tool No. 2

Usage of Social Networking Sites (SNSs) The Social Network Sites tool comprises twenty-nine distinct things pertaining to five fundamental and widely utilized Social Network Sites.

### Reliability of the Tools

The reliability of the instruments was determined using Cronbach's Alpha. The reliability analysis of the Big Five Personality Traits (BFPTs) tool demonstrates robust internal consistency across all subscales, with Cronbach's Alpha values between 0.916 and 0.972, signifying a highly reliable instrument. Openness ( $\alpha = 0.916$ ), conscientiousness ( $\alpha = 0.972$ ), extraversion ( $\alpha = 0.933$ ), agreeableness ( $\alpha = 0.956$ ), and neuroticism ( $\alpha = 0.951$ ) exhibit outstanding reliability, affirming that each subscale accurately evaluates its respective trait. The BFPTs scale exhibits robust internal consistency, evidenced by a Cronbach's Alpha of 0.867, so affirming the instrument's reliability in assessing personality traits among secondary school students. The findings indicate that the BFPTs instrument is dependable for acquiring accurate and consistent data within the study's context. The reliability assessment of the Usage of Social Network Sites (USNSs) tool demonstrates outstanding internal consistency across all subscales, with Cronbach's Alpha values ranging from 0.965 to 0.979, signifying a very reliable instrument. Facebook ( $\alpha = 0.965$ ), WhatsApp ( $\alpha = 0.969$ ), Instagram ( $\alpha = 0.979$ ), Twitter ( $\alpha = 0.979$ ), and TikTok ( $\alpha = 0.974$ ) exhibit remarkable reliability, ensuring consistent evaluation of social media usage behaviors. The overall USNSs scale, with a Cronbach's Alpha of 0.917, further corroborates the instrument's trustworthiness. The findings demonstrate that the USNSs instrument reliably acquires accurate data concerning students' social media usage patterns in the study.

### Validity of the Research Tools

#### Content Validity and Construct Validity

The research instrument employed in this study was enhanced by the systematic recommendations and contributions of five distinct professionals in educational research. Their perspectives and observations were gathered to assess the instrument's validity. Construct validity refers to the extent to which a measurement tool accurately represents the theoretical construct it intends to evaluate. It assesses the instrument's accuracy in measuring the abstract concept or characteristic it claims to evaluate. Construct validity is crucial in research as it ensures that the outcomes obtained from a tool accurately reflect the underlying theoretical concept, rather than being affected by extraneous variables or biases.

### Data Collection Procedure

Researchers developed an online Google form as a questionnaire and being a computer teacher, shared with the computer teachers at the schools of the District Attock. Items of the questionnaire were explained for better results. The procedure was initially applied on 50 students for pilot testing, items difficulty level was observed and then changes were made to get maximum of accurate results.

## Results and Analysis

### Co-efficient of Correlation

The correlation coefficient is a numerical measure of correlation, indicating a statistical relationship between two variables. The variables in question may be depicted as two columns inside a particular dataset including observations, typically known as a sample. Alternatively, they may be considered as two elements of a multivariate random variable that adheres to a recognized distribution.

**H<sub>1</sub>:** There is a significant relationship between AI-powered social network site usage and academic performance.

**Table 1**  
*Correlation Analysis*

AI Usage	Pearson Correlation	AI Usage	AP
	Sig. (2-tailed)	1	.531**
	n	530	530
AP	Pearson Correlation	.531**	1
	Sig. (2-tailed)	.000	
	n	530	530

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The correlation analysis demonstrates a strong positive association between AI Usage and Academic Performance (AP), evidenced by a Pearson correlation coefficient of .531, signifying a moderate positive correlation. This indicates that increased utilization of AI tools correlates with enhanced academic performance, implying that as students engage more with AI resources, their academic success tends to elevate. The affirmative nature of this link suggests that AI usage may be positively influencing learning results, potentially by improving study efficiency or offering superior educational assistance.

The significance value (.000) demonstrates that this connection is highly significant at the 0.01 level (2-tailed), indicating that the probability of this finding arising by chance is quite low. This reinforces the veracity of the observed correlation between AI usage and AP. The investigation utilized a sample size (N=530), establishing a solid foundation for extrapolating the findings to a broader population, hence enhancing the credibility and significance of the results.

**H<sub>2</sub>:** The Big Five personality traits significantly correlate with academic performance.

**Table 2**  
*Correlation Analysis*

BFPTs	Pearson Correlation	BFPTs	AP
	Sig. (2-tailed)	1	.550**
	n	530	530
AP	Pearson Correlation	.550**	1
	Sig. (2-tailed)	.000	
	n	530	530

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The correlation analysis reveals a strong positive association between Big Five Personality Traits (BFPTs) and Academic Performance (AP), evidenced by a Pearson correlation coefficient of .550, indicating a moderate positive correlation. This indicates that pupils exhibiting elevated positive personality qualities, including conscientiousness, openness, extraversion, and agreeableness, are likely to attain superior academic achievement, although diminished neuroticism may also provide beneficial effects. The affirmative nature of this link suggests that these personality traits may significantly contribute to improved learning outcomes and academic achievement.

The significance value (.000) indicates that this association is highly significant at the 0.01 level (2-tailed), suggesting a minimal likelihood of this finding arising by chance. This substantiates the dependability of the correlation identified between BFPTs and AP. The analysis utilized a sample size (n=530), providing a robust foundation for generalizing the findings to a wider student population, hence augmenting the validity and significance of the conclusions reached.

**H<sub>3</sub>:** The Big Five personality traits mediate the relationship between AI-powered social network site usage and academic performance.

**Table 3**  
*MATRIX procedure*

**PROCESS Procedure for SPSS Version 4.2**

Written by Andrew F. Hayes, Ph.D. [www.afhayes.com](http://www.afhayes.com)  
Documentation available in Hayes (2022). [www.guilford.com/p/hayes3](http://www.guilford.com/p/hayes3)

**Model: 4**

Y: AP  
X: AI Usage  
M: BFPTs

**Sample Size: 530**

**Outcome Variable:**

**BFPTs**

**Model Summary**

R	R-sq	MSE	F	df1	df2	p
.9579	.9177	.1911	5884.7608	1.0000	528.0000	.0000

**Model**

	Coeff	SE	t	p	LLCI	ULCI
constant	.0100	.0467	.2135	.8310	-.0818	.1017
AI Usage	1.0010	.0130	76.7122	.0000	.9754	1.0266

**Outcome Variable:**

AP

**Model Summary**

R	R-sq	MSE	F	df1	df2	p
.5498	.3023	1.8788	114.1597	2.0000	527.0000	.0000

**Model**

	Coeff	SE	t	p	LLCI	ULCI
constant	1.0841	.1464	7.4036	.0000	.7965	1.3718
AI Usage	.0608	.1426	.4268	.6697	-.2193	.3409
BFPTs	.5356	.1365	3.9252	.0001	.2675	.8037

**DIRECT AND INDIRECT EFFECTS OF X ON Y**

**Direct effect of X on Y**

Effect	se	t	p	LLCI	ULCI
.0608	.1426	.4268	.6697	-.2193	.3409

**Indirect effect(s) of X on Y:**

	Effect	Boot SE	Boot LLCI	Boot ULCI
BFPTs	.5361	.1431	.2484	.8121

**ANALYSIS NOTES AND ERRORS**

Level of confidence for all confidence intervals in output: 95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals: 5000

----- END MATRIX -----



The mediation analysis employing PROCESS Model 4 investigates the function of Big Five Personality Traits (BFPTs) as a mediator between AI Usage and Academic Performance (AP). The initial model demonstrates a substantial positive impact of AI usage on BFPTs, with a coefficient of 1.001 ( $p = .000$ ), signifying that augmented AI usage is closely linked to elevated positive personality traits. This model accounts for 91.77% of the variance in BFPTs ( $R^2 = .9177$ ), indicating a strong correlation. The second model indicates that BFPTs exert a substantial positive influence on AP, evidenced by a coefficient of .5356 ( $p = .0001$ ), implying that students possessing more advantageous personality traits are likely to achieve superior academic performance. The direct impact of AI usage on academic performance is not significant (coefficient = .0608,  $p = .6697$ ), suggesting that AI usage does not directly affect academic achievement when adjusting for BFPTs. The indirect effect via BFPTs is substantial, with a value of .5361 (BootCI = .2484 to .8121), indicating partial mediation. The results indicate that AI usage positively influences AP indirectly via its effect on BFPTs, hence corroborating the idea that personality traits moderate this relationship. This underscores the significance of constructive personality development in utilizing AI tools for enhanced academic results.

## Findings

The correlation analysis indicates a strong positive association between AI Usage and Academic Performance (AP), evidenced by a moderate positive correlation ( $r = .531$ ,  $p = .000$ ). This suggests that increased AI usage correlates with improved academic achievement, indicating a beneficial effect on learning outcomes. The correlation study indicates a substantial positive association between Big Five Personality Traits (BFPTs) and Academic Performance (AP), evidenced by a moderate positive correlation ( $r = .550$ ,  $p = .000$ ). This suggests that children possessing positive personality traits generally attain superior academic achievement, underscoring the influence of personality in improving learning outcomes. The mediation analysis shows that AI Usage indirectly influences Academic Performance (AP) through Big Five Personality Traits (BFPTs), as indicated by a significant indirect effect (.5361, BootCI = .2484 to .8121). While AI Usage positively affects BFPTs (coefficient = 1.001,  $p = .000$ ) and BFPTs significantly enhance AP (coefficient = .5356,  $p = .0001$ ), the direct effect of AI Usage on AP is not significant ( $p = .6697$ ), confirming partial mediation by BFPTs.

## Discussion

The results of the present study correspond with the existing literature examining the connections among AI utilization, personality characteristics, and academic achievement.

### AI Usage and Academic Performance

The significant positive correlation between AI Usage and Academic Performance ( $r = .531$ ,  $p = .000$ ) aligns with previous research indicating that AI tools enhance learning efficiency and academic outcomes. Jabar and Yousif (2023) found that the integration of AI in educational settings improved learning processes and student performance by offering personalized learning experiences and efficient resource management. Similarly, Zhang and Aslan (2022) demonstrated that AI-assisted learning platforms contribute to better academic achievement by facilitating adaptive learning environments. These findings suggest that AI usage supports students' academic performance by optimizing study methods and enhancing engagement (Jabar & Yousif, 2023; Zhang & Aslan, 2022).

### Big Five Personality Traits and Academic Performance

The positive association between Big Five Personality Traits (BFPTs) and Academic Performance ( $r = .550$ ,  $p = .000$ ) substantiates the influence of personality on educational achievement. These findings align with those of Komarraju *et al.* (2011), who identified conscientiousness and openness as key determinants of academic success, highlighting that students possessing these traits are generally better organized and motivated. Furthermore, Poropat (2009) determined that conscientiousness is a robust predictor of GPA, hence confirming the association between favorable personality traits and improved educational results. These investigations underscore the impact of personality on academic achievement, corroborating the existing findings (Komarraju *et al.*, 2011; Poropat, 2009).

### Mediation by Big Five Personality Traits

The mediation analysis indicates that BFPTs partially mediate the relationship between AI usage and academic performance, suggesting that positive personality traits indirectly enhance this influence. While direct studies on this mediation are sparse, the role of personality as a mediator in educational environments is supported by past research. Chamorro-Premuzic and Furnham (2003) discovered that personality factors regulate the connection between cognitive ability and academic success, highlighting the intricate interaction between individual variability and learning outcomes. The findings suggest that personality qualities directly influence academic achievement and mediate the impacts of external educational aids such as AI (Chamorro-Premuzic & Furnham, 2003).

### Recommendations

The correlation analysis shows a significant positive relationship between AI Usage and Academic Performance (AP), with a moderate positive correlation ( $r = .531$ ,  $p = .000$ ). This indicates that higher AI Usage is associated with better academic performance, suggesting a positive impact on learning outcomes. Hence, it is recommended that educational institutions integrate AI tools into the learning environment to enhance academic performance by providing personalized learning experiences and efficient resource management. The correlation study indicates a substantial positive association between Big Five Personality Traits (BFPTs) and Academic Performance (AP), evidenced by a moderate positive correlation ( $r = .550$ ,  $p = .000$ ). This suggests that children possessing positive personality traits generally attain superior academic achievement, underscoring the influence of personality in improving learning outcomes. Therefore, it is advisable that educational programs emphasize the cultivation of good personality traits, like conscientiousness, openness, and agreeableness, via character development workshops and mentorship initiatives to enhance students' academic performance. The mediation analysis shows that AI Usage indirectly influences Academic Performance (AP) through Big Five Personality Traits (BFPTs), as indicated by a significant indirect effect (.5361, BootCI = .2484 to .8121). While AI Usage positively affects BFPTs (coefficient = 1.001,  $p = .000$ ) and BFPTs significantly enhance AP (coefficient = .5356,  $p = .0001$ ), the direct effect of AI Usage on AP is not significant ( $p = .6697$ ), confirming partial mediation by BFPTs. Hence, it is recommended that educational policymakers design AI-enhanced learning environments that not only provide academic support but also encourage the development of positive personality traits, thereby maximizing the overall educational impact.

### Conclusion

The findings indicate that AI Usage positively influences Academic Performance (AP), suggesting that integrating AI tools into educational settings can enhance learning outcomes through personalized learning experiences. Additionally, the positive relationship between Big Five Personality Traits (BFPTs) and AP highlights the importance of fostering positive personality traits to improve academic achievements. The mediation analysis further reveals that AI Usage indirectly impacts AP through BFPTs, emphasizing the role of personality development in maximizing the educational benefits of AI tools. These results demonstrate the interconnectedness of AI Usage, personality traits, and academic performance, suggesting that a holistic educational approach combining technology and character development is essential for optimizing student outcomes. The partial mediation effect of BFPTs underscores the significance of positive personality traits as a mechanism through which AI enhances academic success. Conclusion for Hypothesis: The study concludes that AI Usage positively affects Academic Performance indirectly through its influence on Big Five Personality Traits, supporting the hypothesis of partial mediation. This emphasizes the dual role of technological integration and personality development in enhancing academic achievements, guiding educational stakeholders in designing comprehensive strategies for improved learning experiences.

### Limitations and Future Directions

The study was conducted in only one province of the Pakistan with limited sample, therefore, in future, researchers are advised to conduct study on the same variables with inclusion of other three province and engaging large sample size.

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## Declaration of Interest

The authors declare that there is no clash of interest.

## Data Availability

Data will be provided upon a format request.

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