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Article

Does AI Usage Improve Academic Performance, or Student Behaviour Matter More? Evidence from a Large-Scale Study in India

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Abstract: The rapid penetration of artificial intelligence (AI) in the education sector has created much debate regarding the actual impact of AI on student learning outcomes. Yet, there is limited research that investigates whether AI impacts student learning outcomes through direct or indirect mechanisms. This study aims to design a behavioral mediation model to examine the relationship between AI usage frequency, encouragement of teachers, and academic enhancement for students in the regional setting of a developing country, namely India. The study collected the required data from 1,557 school- and college-level students using a structured questionnaire method. A composite Academic Enhancement Index is designed to represent the perceived academic enhancement of access to learning resources, academic performance, and learning motivation for the students. Ordinary Least Squares regression analysis is conducted to verify the proposed research hypotheses. The study reveals that frequency of usage of AI predicts academic enhancement for the students; however, encouragement of teachers does not show a statistically significant impact on academic enhancement for the students. Yet, encouragement of teachers influences academic enhancement through the frequency of using AI for the students, indicating that there is a behavioral mediation relationship between the variables. This study provides much-needed empirical evidence from the regional setting of a developing country; hence, it contributes to the existing body of knowledge of using AI for the education sector

Keywords: Artificial Intelligence in Education, Academic Enhancement, AI Usage Behaviour, Student Learning Outcomes, Behavioural Mediation, Educational Technology Adoption

1. INTRODUCTION

The educational system today relies on Artificial Intelligence as its primary technological driver because it changes how students access educational content and process information and use their acquired knowledge in various learning environments. AI systems now serve as cognitive partners which help users to solve problems and create language content while they receive customized learning support and progress through personalized educational routes. The rapid spread of generative AI tools has led to increasing academic discourse about their teaching effectiveness and ethical concerns and their effects on how students learn. Empirical research presents an incomplete picture of students' actual AI usage because the research shows different results based on various contexts while the shared understanding of AI's impact on academic performance remains absent (Zawacki-Richter et al., 2019; Holmes et al., 2024; OECD, 2024).

The educational research field requires researchers to understand two different concepts because they need to differentiate between technological access and actual student participation. AI tools in educational settings do not produce real academic benefits until students understand how to use them effectively. Technology adoption theories show that results depend on users obtaining access to technology because they need to use it intentionally and consistently. The educational environment needs this distinction because students' learning results depend on their

motivation levels and self-control abilities together with the educational environment which teachers provide. Researchers in modern educational technology study AI adoption because they need to understand how AI adoption affects students' academic performance by studying students' behavioral patterns (Venkatesh et al., 2003; Venkatesh et al., 2012; Al-Adwan et al., 2024).

The majority of institutions recognize that teachers serve as essential drivers for technology implementation. Teacher support functions as a way to establish AI usage as legitimate while decreasing student uncertainty and shaping their tendency to try out new technologies. The current research evidence does not provide definite results about whether teacher support helps students achieve better academic results or whether it leads to improved student behavior. Existing research studies make the error of equating institutional support with educational results because they fail to recognize that support only changes results when it leads to different patterns of resource utilization. Researchers now require more empirical models because they need to test mediation processes as their research requires direct effects confirmation (Selwyn, 2022; Zhai & Chen, 2024).

The educational system requires a solution to its second major challenge which involves establishing proper educational grade levels. Existing research studies show that students who study at higher education institutions display more advanced digital skills which results in stronger academic performance from AI systems. Schools now experience more frequent AI concept introduction through policy changes and curriculum updates. Researchers still need to study how AI usage affects academic performance between school students and college students. The research gap exists because it enables educators to develop AI educational programs which provide equal learning opportunities to all school levels.

The most important challenges that educational ecosystems from developing regions encounter emerge through these inquiries. The official government documents of India show that national policies support digital transformation and AI integration, yet different states and institutions implement these policies at different speeds. The researchers who conduct empirical studies on AI adoption must examine areas that contain both geographical complex structures and multiple infrastructural systems together with educational systems that function in between urban and rural regions. Researchers who study these contexts can evaluate AI benefits through samples which extend beyond metropolitan areas and elite institutions (Government of India, 2020; NITI Aayog, 2024).

While there has been an increase in literature on artificial intelligence in education, there is a critical research gap in terms of understanding if artificial intelligence itself enhances academic performance or if it is the behavioral engagement with artificial intelligence by students that enhances academic performance. Most research has been conducted on the availability and support of artificial intelligence, while very little research has been conducted on the behavioral factors by which artificial intelligence is linked to academic enhancement. Moreover, very little research has been conducted in the context of regional and semi-urban areas in developing countries like India, where factors like digital readiness, teacher encouragement, and student learning behaviors may have a substantial impact on academic enhancement. In this regard, this study aims to address the research gap by understanding if the frequency of artificial intelligence usage is linked to academic enhancement in students or if it is linked to behavioral factors, with empirical evidence collected from students in schools and colleges in the region of Uttarakhand, India. The study aims to contribute to the emerging literature on artificial intelligence in education by testing a model in which institutional encouragement is distinguished from behavioral engagement with artificial intelligence.

2. Literature Review

Artificial Intelligence (AI) has progressed in education from its initial testing stage with experimental teaching systems to its current state of widespread implementation through student-facing technologies which shape the way students study and acquire knowledge. The early research on AI in education dedicated its efforts to studying intelligent tutoring systems and adaptive learning platforms which created personalized learning experiences through better instructional delivery and improved student feedback systems. The research showed that algorithmic systems can enhance learning results when they function inside predefined teaching systems. The research focus shifted to study broader educational uses of AI technology which included learning analytics and automated assessment and the

latest development of generative AI systems that can process natural language and create written content (Zawacki-Richter et al., 2019).

The current academic research on AI describes its function as an educational tool which evolves student learning through its role as a cognitive enhancement mechanism. The research conducted during the last two years demonstrates how AI technology improves educational resource accessibility while helping students study independently and overcoming challenges related to time and available teaching resources (Crompton & Burke, 2023; Holmes et al., 2024). Students use generative AI tools to alter their information search methods while creating academic work and handling mental tasks. The research results about academic performance show mixed outcomes which demonstrate that AI educational benefits depend on the specific environment and student behavior instead of the technology's ability to deliver educational outcomes (OECD, 2024).

The research examines how educational institutions support teacher work within the framework of behavioral research. Teachers function as key mediators between policy-level digital initiatives and classroom-level adoption. According to empirical research students improve their AI tool usage through teacher support which decreases their fear of using the technology (Selwyn, 2022; Zhai & Chen, 2024). The evidence remains uncertain about how teacher support directly affects students' academic results. The research conducted by Ifenthaler and Schumacher in 2024 shows that teacher support increases student adoption rates but does not lead to better academic results when student usage behavior is taken into account.

The study shows that generative AI tools will bring fundamental changes to academic practices through their ability to produce content at high speed and create explanations and provide learning assistance through their development of multiple drafts (Kasneci et al., 2023; Dwivedi et al., 2023; Lim et al., 2024). The tools provide great advantages that improve efficiency and build learning confidence but people have raised objections about users who depend too much on these tools because it leads to loss of creativity and shallow learning. The academic effects of generative AI depend on how people use the technology according to recent studies which show that educational results depend on both the frequency of use and the specific ways the technology is applied (UNESCO, 2024; Cotton et al., 2025).

The situation becomes more complicated when you work in developing and emerging economies. Research conducted outside of Western countries shows that different levels of infrastructure development and digital literacy and teacher readiness for AI technology usage determine how effectively organizations adopt AI systems (Alam 2023 World Bank 2024). The Indian government uses its national education framework through the National Education Policy 2020 to encourage schools and universities to adopt artificial intelligence technology in their educational programs. Recent assessments show that there exists a continuing disparity between what educational policies aim to achieve and what teachers actually practice in their classrooms particularly in semi-urban areas and regions with diverse geographical characteristics (Government of India 2020 NITI Aayog 2024).

The current research field shows a significant research gap because it lacks studies about mechanism testing. Researchers show that both teacher encouragement and institutional support act as vital elements for student success, but their research mostly depends on correlational studies which assume direct links to academic achievement. The recent studies which have emerged in the last few years only include a small group of research studies which specifically examine how behavioral factors such as usage frequency act as mediators in the Al-Adwan et al. 2024 study and the Ifenthaler & Schumacher 2024 study.

The literature synthesis produces three important findings. First, artificial intelligence improves academic accessibility and student engagement and academic performance evaluation, yet its results depend on specific situations. Second, teacher encouragement and institutional support enable students to achieve academic success, but their actual academic results are not yet known. Third, students who use AI tools show behavioral engagement, which serves as the main bridge between institutional support and their academic success.

Conceptual Framework

The conceptual model for the study was developed to investigate the role of behavioural mechanisms in academic enhancement due to artificial intelligence (AI) adoption. In this model, it was proposed that the benefits to academics due to AI adoption are not directly influenced by institutional encouragement but are mainly influenced by behavioural factors. In this model, AI adoption frequency was considered to be an important behavioural factor that links institutional encouragement with academic enhancement.

Teacher encouragement was considered an important institutional factor that can influence student behavioural factors in adopting AI tools in their academic activities. Instead of directly testing the impact of teacher encouragement on academic enhancement, this model was developed to test whether teacher encouragement influences academic enhancement indirectly through behavioural factors. Academic enhancement was measured using a composite index consisting of access to learning resources, perception of academic performance, and motivation to learn. This model was developed to test both direct and indirect relationships among variables and whether behavioural factors play an important role in influencing AI adoption in academic enhancement.

This study contributes the literature in three ways: It begins by developing a behavioral mediation model by establishing the relationship between AI usage and academic enhancement. Instead of treating AI adoption as a technological input, this study shows that the driving force behind enhanced academic outcomes is actually behavioral engagement with AI, in terms of usage frequency, thus offering a more mechanism-based explanation of AI-enhanced learning outcomes.

Second, the study offers a large-scale research with a regional context, as data was collected from 1,557 school- and college-level students. Most of the studies done on AI in the context of education have been conducted in technologically advanced settings, whereas this study attempts to understand the context of AI adoption in a geographically diversified semi-urban environment.

Third, the research develops a composite Academic Enhancement Index, which aggregates the perceived improvement in terms of access to learning resources, academic performance, and student learning motivation into a single analytical framework. The aggregation of behavioral usage variables with a multidimensional outcome index offers a richer empirical research design in assessing the educational impact of artificial intelligence compared to previous single-indicator research designs.

Research Model and Hypotheses Development

The current study proposes a behavioural research model in which the role of artificial intelligence (AI) adoption in enhancing academic performance among students can be explored. Although existing literature has explored the role of AI tool availability and encouragement in enhancing academic performance, the current study asserts that academic performance does not enhance automatically due to AI tool availability. Rather, it is determined by the behavioural use of AI tools in academic activities. Therefore, the current study proposes a distinction between AI tool availability, encouragement, and usage in order to understand AI tool impact on academic performance more clearly.

The proposed model has AI usage frequency as the independent variable, teacher encouragement as the institutional factor, and academic enhancement as the dependent variable. Academic enhancement is measured using a composite index, which includes improvements in the accessibility of educational resources, academic performance, and student motivation in learning. The study also seeks to understand if teacher encouragement has a direct or indirect effect on academic enhancement through behavioral engagement in AI. This provides the study an opportunity to investigate a mediator rather than a direct relationship between the two variables.

The theoretical base of the model is grounded in the behavioural technology adoption theory, as outlined in Venkatesh et al. (2012), which asserts that the effectiveness of technology in a digital form depends on actual user behaviour, not on its availability. In the case of AI learning, it is expected that the more frequently a student uses AI, the more academic benefits he/she will attain, as more frequent use of AI will result in more learning resources, more

efficient task completion, and increased motivation. Teacher encouragement is also expected to affect student behaviour, as it will increase their motivation towards using AI, even if it does not affect their academic performance.

Based on this research model, the study tests the following hypotheses:

H1: AI usage frequency has a positive effect on students' academic enhancement.

H2: Teacher encouragement has a positive effect on AI usage frequency.

H3: Teacher encouragement has a direct effect on students' academic enhancement.

H4: AI usage frequency mediates the relationship between teacher encouragement and academic enhancement.

3. Methodology

The researchers used a quantitative cross-sectional study method to investigate how students in Uttarakhand India perceive academic improvements through their use of Artificial Intelligence (AI) technology. The researchers used the study design as an explanatory framework to show how different variables related to each other while they tested the mediation effects which emerged from their research on behavioral technology adoption theory according to Venkatesh et al. 2012 and Hayes 2018.

The data were collected through a structured questionnaire administered using Google Forms. The instrument used closed-ended Likert-scale items with binary response questions and included selected open-ended prompts which researchers would analyze later through thematic analysis. The research team successfully collected 1,557 valid responses after they finished screening for incomplete submissions. The educational networks of multiple districts in Uttarakhand operated a voluntary participation model which researchers used as their sampling method. The study obtained informed consent from all participants while they could choose whether to participate which allowed the research team to follow social science research ethics standards.

The sample included both school-level and college-level students, allowing subgroup robustness testing.

The questionnaire operationalized three core constructs:

1. **AI Usage Frequency (Independent Variable)**

A five-point ordinal scale, with 1 denoting "never" to 5 denoting "always," was used to measure the behavioral use of AI tools for academic assignments.

2. **Teacher Encouragement (Institutional Variable)**

Teachers are actively promoted or not. The use of AI was measured as a binary variable(0= no, 1= yes).

3. **Perceived Academic Enhancement (Dependent Variable)**

Built as a composite index using three indicators:

- Perceived enhancement of educational resource accessibility
- A perceived rise in academic achievement
- A greater desire to learn because of AI

The study used a five-point Likert scale to measure accessibility responses which ranged from Strongly Disagree to Strongly Agree. The study used Yes/No responses to measure performance and interest. The study used numerical codes to convert Likert responses into 1 to 5 values and binary responses into 0 to 1 value for measurement standardization.

The Academic Enhancement Index (AEI) was created through the mathematical process of calculating the average value of three standardized measurement systems. The composite index system functions to decrease measurement errors while it provides a comprehensive view of how people perceive their academic progress. The

internal consistency for the three indicators that make up the Academic Enhancement Index was done through Cronbach's alpha. The results showed that the reliability coefficient was above the acceptable limit of 0.70.

The researchers conducted data cleaning operations before they performed regression analysis. The researchers used listwise deletion to eliminate missing data in essential variables which resulted in the creation of a final dataset that they used for their inferential tests. Descriptive statistics were used to measure central tendency and distributional characteristics of data.

The primary hypothesis was tested through the application of Ordinary Least Squares (OLS) regression method. The base regression model was specified as:

$$AEI = \beta_0 + \beta_1 Usage + \beta_1 TeacherEnc + \varepsilon$$

Where:

- $AEI =$ Academic Enhancement Index
- $Usage =$ AI usage frequency
- $TeacherEnc =$ Teacher encouragement
- $\varepsilon =$ error term

To examine mediation, a two-step regression framework was applied:

Step 1:

$$Usage = \alpha_0 + \alpha_1 TeacherEnc + v$$

Step 2:

$$AEI = \gamma_{0=}\gamma_1 Usage + \gamma_2 TeacherEnc + \eta$$

The robustness and statistical validity of the results obtained from the regression analysis were checked through various statistical tests. Firstly, the existence of multicollinearity between the independent variables was checked through the application of the Variance Inflation Factor (VIF) statistical test. The results obtained from the VIF statistical test revealed that the values are far below the acceptable limit of 5. This revealed that there are no problems related to multicollinearity in the model.

Further, subgroup regression analysis was carried out to check if the relationship between AI usage frequency and academic enhancement holds for both school and college students. The results revealed that the relationship holds for both subgroups. This revealed the robustness and validity of the results obtained from the regression analysis.

Further, the statistical validity of the results obtained from the regression analysis was checked through the application of the F-statistical test. The results revealed that the overall model is statistically significant. The results obtained from the regression analysis were also checked for their explanatory validity through the application of the coefficient of determination R^2 and the adjusted R^2. The R^2 measures the explanatory validity of the results obtained from the regression analysis. Although the R^2 value

4. Results

The empirical analysis examined the relationships among AI usage frequency, teacher encouragement, and perceived academic enhancement. The Academic Enhancement Index functioned as the dependent variable which measured students perceived educational progress through their increased access to learning materials and their improved academic results and their rising interest in studying.

Descriptive Findings

AI utilization among students occurs at moderate levels according to descriptive statistics which show that most students use AI tools between the times of "Sometimes" and "Often." The study results demonstrate that AI tools have established themselves as standard equipment in the academic environment which exists in Uttarakhand. Figure 1 demonstrates descriptive patterns of AI engagement by showing how often respondents use it. The high usage frequency shows that AI tools are actively integrated into students' academic routines as most of students reported at least average to high usage levels of AI tools.

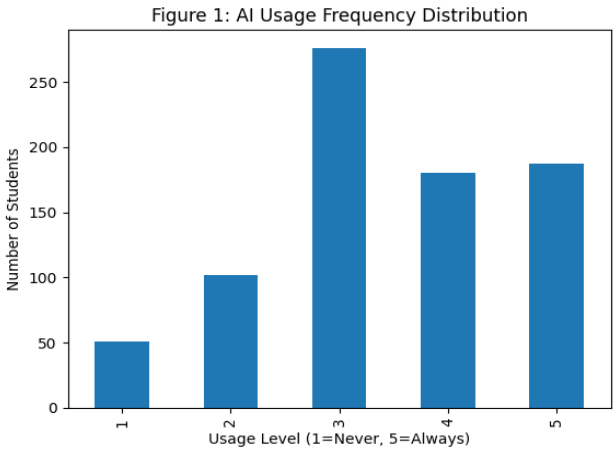

Figure 1: Distribution of AI usage frequency among respondents

The Academic Enhancement Index displays a positive skewing pattern because most students view AI technology as an advantage for improving their access to learning materials and their academic performance. The difference in responses shows that people had different experiences with the situation. Figure 2 shows the distribution of the Academic Enhancement Index, with a left skew suggesting generally positive perceptions of AI on academics.

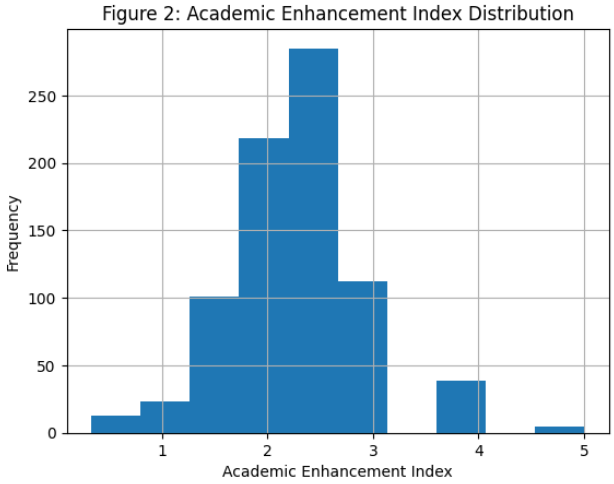

Figure . Distribution of the Academic Enhancement Index.

A specific group of respondents reported teacher encouragement, which demonstrates that schools provide educational support to students, but the support exists in different levels across various educational institutions The scatter plot in Figure 3 shows that students who use AI tools more frequently achieve better academic results according to the Academic Enhancement Index.

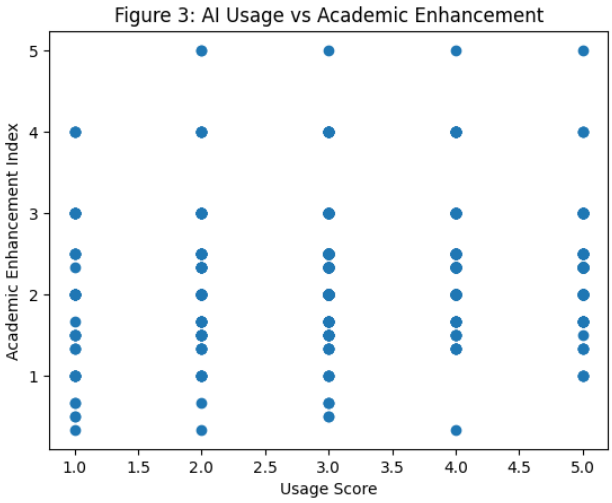

Figure 3 Relationship between AI usage frequency and Academic Enhancement Index

Main Regression Results

To examine the relationship between the usage of AI tools, teacher encouragement, and academic enhancement, Ordinary Least Squares (OLS) regression analysis was employed, with the Academic Enhancement Index (AEI) as the dependent variable. The analysis revealed that the usage of AI tools has a positive relationship with academic enhancement, as it was a statistically significant predictor of academic enhancement ($\beta = 0.061$, SE = 0.022, t = 2.84, p = 0.004). This indicates that students who use AI tools more frequently are more likely to report an improvement in access to learning resources, academic performance, and learning motivation.

The Ordinary Least Squares regression analysis results show how AI usage frequency and teacher encouragement impact the Academic Enhancement Index through data presented in Table 1.

Dependent Variable: Academic Enhancement Index
Sample Size (N): 1,557

Table 1. Regression analysis predicting Academic Enhancement Index

Predictor	B (Coefficient)	SE (Standard Error)	t-value	p-value
Constant	2.087	0.075	27.84	< 0.001
AI Usage Frequency	0.061	0.022	2.84	0.004
Teacher Encouragement	−0.014	0.051	−0.27	0.785

Model Statistics:

$R^2 = 0.011$
Adjusted $R^2 = 0.008$
F-statistic = 4.21 (p = 0.015)

The relatively low R^2 value is expected in perception-based behavioural studies, as students' academic perceptions are influenced by multiple psychological and contextual factors beyond AI usage.

On the contrary, teacher encouragement does not have a statistically significant direct effect on academic enhancement, as its value is not significantly different from zero ($\beta = -0.014$, SE = 0.051, t = -0.27, p = 0.785). The non-significant value of the coefficient indicates that institutional encouragement, per se, does not enhance students'

academic performance without their actual behavioural engagement with AI tools. The above findings support the central argument of this study, which emphasizes that academic benefits of AI tools are realized through actual usage behaviour, not through institutional support.

The overall regression model is statistically significant ($F = 4.21$, $p = 0.015$), indicating that the explanatory variables jointly contribute to the prediction of academic enhancement. Although the model explains a relatively small proportion of variance in the dependent variable ($R^2 = 0.011$), this result is consistent with perception-based behavioural research, where academic perceptions are influenced by multiple psychological and contextual factors beyond the scope of the present model. Therefore, the statistical significance and direction of the coefficients remain meaningful for interpreting the relationship between AI usage and academic enhancement.

Multicollinearity Diagnostics

The regression estimates will maintain their reliability through multicollinearity diagnostics which used Variance Inflation Factor (VIF) testing according to the results shown in Table 2. The VIF values for both AI usage frequency and teacher encouragement are 1.09 which is well below the commonly accepted threshold of 5. The prediction variables show high independence from each other which results in stable and unbiased regression coefficient estimation. The relationships shown in Table 1 can be interpreted with complete confidence.

Table 2 Variance Inflation Factor (VIF) values for regression predictors.

Predictor	VIF
AI Usage Frequency	1.09
Teacher Encouragement	1.09

Mediation Analysis

In order to examine if teacher encouragement indirectly affects academic enhancement through behavioral engagement in AI tools, a mediation analysis was conducted by employing a two-step regression model. This analysis tested if the frequency of AI tool usage would mediate the relationship between teacher encouragement and Academic Enhancement Index (AEI).The results of this analysis are summarized in Table 3.

Table 3 Mediation analysis examining the indirect effect of teacher encouragement on academic enhancement through AI usage frequency.

Path	Relationship	Coefficient (B)	Significance
a	Teacher Encouragement → AI Usage	Positive	Significant
b	AI Usage → Academic Enhancement	Positive	Significant
c	Teacher Encouragement → Academic Enhancement (total effect)	Small	Weak
c′	Teacher Encouragement → Academic Enhancement (direct effect, controlling for usage)	Near zero	Not significant
Sobel Test	Indirect Effect (a × b)	—	$p < 0.01$

The findings show that encouragement by the teacher has a positive and statistically significant impact on the usage frequency of AI (Path a), which confirms that institutional encouragement is significant in motivating students to use AI in their academic practices. In the second phase of the analysis, it was evident that AI usage frequency has a positive and statistically significant impact on academic enhancement (Path b), which confirms the findings that behavioural engagement with AI contributes to improved access to learning resources, academic performance, and learning motivation.

However, the direct impact of teacher encouragement on academic enhancement loses statistical significance when controlled by the frequency of AI usage (Path c′), although the total impact remains low. The Sobel test also reveals that the indirect effect is significant at $p < 0.01$. This reveals that teacher encouragement does not have a direct impact on the academic performance of students; rather, it is an indirect mediator through behavioural engagement with AI.

The results from Tables 1 and 2 and Table 3 show a pattern that matches theoretical expectations. The primary factor which leads to improved academic outcomes through AI usage depends on students' frequency of AI technology usage for their educational tasks while teacher support acts as a secondary factor. The research results remain strong because of the absence of multicollinearity while the mediation analysis shows how institutional support leads to academic results through its effects on student behavior (Al-Adwan et al., 2024).

5. Conclusion

This study aims to determine if artificial intelligence (AI) has a direct impact on the improvement in students' academic performance or if the improvement is a result of behavioral responses to AI. The study utilized a total of 1,557 students in school and college levels in the state of Uttarakhand, India. The study revealed that the frequency of AI usage is a statistically significant predictor in enhancing academic performance, while teacher encouragement is not statistically significant in having a direct impact on academic enhancement. However, teacher encouragement has an indirect impact on academic enhancement through AI usage behavior.

The study adds to the body of knowledge on artificial intelligence in education by offering a behavioural perspective on how the adoption of AI results in academic achievement. Rather than seeing AI as an input that will enhance learning by itself, the study's results show that academic achievement results from students' behavioural response to AI. This study offers empirical support for a behavioural mediation perspective of AI adoption.

However, despite its contributions, the study also has some limitations. The study was based on perception data from a single region. Academic enhancement was based on self-reported data. Further studies can be conducted to build upon this study by using longitudinal data and objective measures of academic performance to further investigate the impact of artificial intelligence in academics.

6. Limitations and Future Research

Despite providing empirical evidence to support the behavioural factors that relate to the usage of artificial intelligence (AI) in improving academic enhancement, the study had some limitations that need to be understood. Firstly, the data was based on cross-sectional data collected from students in a single regional context (Uttarakhand, India), which may not be generalized to other contexts. Secondly, academic enhancement was based on perception-related factors rather than objective factors based on grades or scores in examinations. Thirdly, while perception-related factors are commonly used in studies based on education technology, they may not be an appropriate measure to relate to long-term academic enhancement. Fourthly, while AI usage frequency and teacher encouragement are emphasized in the study, other factors that relate to student motivation levels are not considered in this study.

The avenues for further research are numerous. Firstly, longitudinal studies can be done to investigate whether AI usage has an impact on student performance in the long term. In addition to that, further studies can be done to validate the findings with objective criteria to measure student performance in academics. Further studies can also be done to compare different regions and institutions to understand the impact of AI usage on student performance in different settings.

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