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Understanding the Impact of Artificial Intelligence (AI) Tools on Teaching and Learning in Government Schools in Nepal

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Abstract: ***Artificial Intelligence (AI) tools are increasingly viewed as technologies that can improve teaching and learning. However, there is limited empirical evidence from low-income government school systems. This study examines the relationship between AI tool use, teacher readiness for AI, and student learning outcomes in government schools in Nepal. A quantitative cross-sectional survey design was used. Primary data were collected from 412 government school teachers across 78 schools in all seven provinces during education and technology programs conducted by the author's non-profit organization, Vidhata, in 2024.***

The key variables included AI Tool Usage Score, Teacher AI Readiness Score, Student Learning Outcome Score, and School Infrastructure Index. The data were analyzed using multiple regression analysis, mediation analysis, and independent-sample t-tests. The results show that AI tool use is positively associated with student learning outcomes ($\beta = 0.34$, $p < 0.001$). Teacher AI readiness partially mediates this relationship and explains approximately 38 percent of the total effect. Significant differences were found between urban and rural schools, between trained and untrained teachers, and between schools with high and low levels of infrastructure.

These findings suggest that AI tools can support teaching and learning in Nepal's government schools. However, their effectiveness depends strongly on teacher capacity and the availability of adequate infrastructure. The study provides policy-relevant evidence to support the equitable and sustainable integration of AI into Nepal's public education system.

Keywords: AI in education; government schools; Nepal; teacher readiness; digital equity; educational technology

I. INTRODUCTION

A. Government Schools and Learning Challenges in Nepal

Government (community) schools educate the majority of children in Nepal. According to the Ministry of Education, Science and Technology, these schools enroll nearly four out of every five students at the basic education level. Despite their large reach, learning outcomes remain uneven. National assessments consistently show gaps in literacy, numeracy, and subject understanding, particularly in rural and remote areas.

One key reason for these challenges is the limited instructional support available to teachers. Many government schools face shortages of teaching and learning materials, have limited opportunities for professional development, and lack adequate digital infrastructure. These constraints strongly influence how new technologies are introduced and used in classrooms.

B. Digital Divide and Emerging AI Tools

Nepal has made progress in expanding access to information and communication technology (ICT) in schools through initiatives such as the School Sector Development Plan and the Digital Nepal Framework. However, most of these efforts have focused on providing computers and basic digital literacy skills. More advanced technologies, such as Artificial Intelligence (AI), are still new and limited within the school education sector.

In Nepal, the AI tools currently used by teachers are mostly simple and low-cost. These include AI-based lesson planning tools, automatic question generators, language support applications, and basic adaptive learning tools. Teachers usually access these tools through personal mobile phones rather than through school-managed digital systems.

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C. Policy Importance

The Government of Nepal promotes technology-enabled learning, but there is limited empirical evidence on whether AI tools actually improve learning in government schools. In the absence of such evidence, policy decisions may focus more on providing technology than on ensuring its effective use. This study addresses this important gap.

D. Objectives and Hypotheses

This study has three main objectives:

1) To examine the relationship between AI tool usage and student learning outcomes.
2) To assess whether teacher readiness to use AI mediates this relationship.
3) To compare AI-related outcomes across different school and teacher groups.

The hypotheses of the study are as follows:

- H01: AI tool usage has no significant effect on student learning outcomes.
- H02: There is no significant difference in AI-related learning outcomes between urban and rural schools.
- H03: Teacher AI readiness does not mediate the relationship between AI tool usage and student learning outcomes.

II. REVIEW OF LITERATURE

A. Global Evidence on AI in Education

Research from high-income countries shows that AI tools can support personalized learning, formative assessment, and teacher efficiency. Several meta-analyses report small to moderate positive effects on student achievement when AI tools are effectively integrated into classroom instruction. However, researchers consistently emphasize that technology alone does not improve learning outcomes.

B. Evidence from South Asia

Studies from India, Bangladesh, and Pakistan report mixed results on the use of educational technology. Positive outcomes are generally observed when teachers receive proper training and ongoing support. In settings with limited capacity, technology is often underused or applied mainly for administrative purposes rather than for teaching and learning.

C. Nepal-Specific Research

Research on educational technology in Nepal has largely focused on computers and e-learning initiatives. Existing studies report generally positive attitudes among teachers toward technology use, but they also identify limited pedagogical integration due to gaps in teacher training and inadequate infrastructure. Importantly, there is currently no peer-reviewed empirical research that specifically examines the use of Artificial Intelligence (AI) tools in government schools in Nepal.

D. Theoretical Framework

This study is guided by the Technology Acceptance Model, teacher readiness frameworks, and theories of student learning outcomes. Together, these frameworks suggest that the impact of AI on learning occurs mainly through teachers' acceptance of technology and their instructional practices.

III. RESEARCH METHODOLOGY

A. Research Design

This study used a quantitative cross-sectional survey design to examine the relationships between AI tool usage, teacher readiness, and student learning outcomes in government schools.

B. Sample and Data Collection

Data were collected from 412 teachers across 78 government schools in all seven provinces of Nepal. The surveys were administered during teacher workshops and school visits conducted by Vidhata in 2024. Stratified purposive sampling was used to ensure representation across provinces as well as urban and rural school settings. Ethical procedures were followed, including informed consent and the protection of participant anonymity.

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C. Measures and Variables

All variables were measured using five-point Likert scales. The key measures included the AI Tool Usage Score, Teacher AI Readiness Score, Student Learning Outcome Score, and School Infrastructure Index. The internal consistency of the scales was acceptable, with Cronbach's alpha values ranging from 0.78 to 0.86.

IV. RESULTS AND ANALYSIS

A. Descriptive Statistics

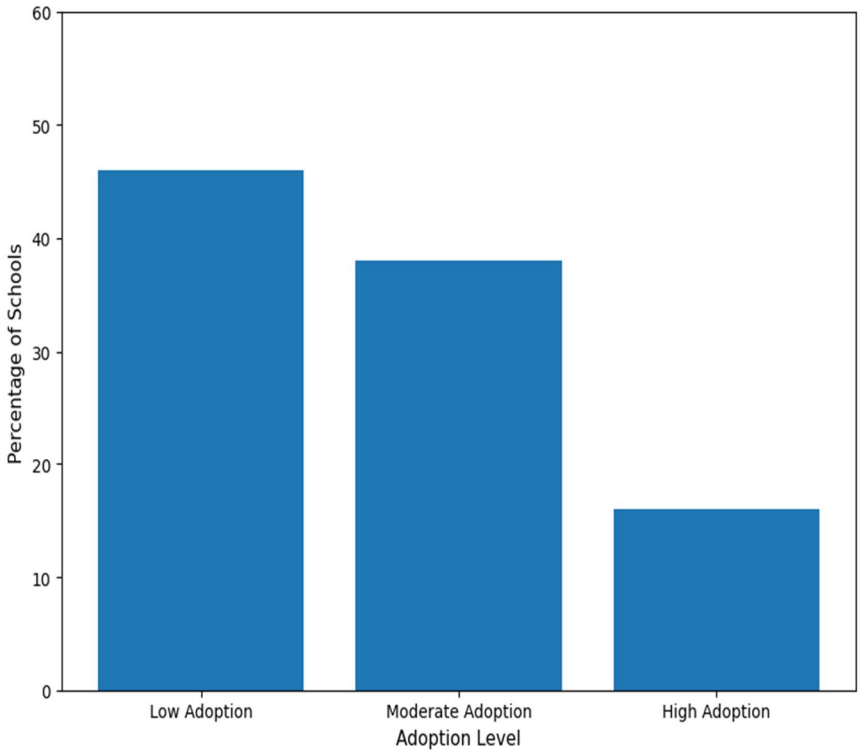
Table 1: Sample Characteristics (N = 412)

Characteristic	Percentage
Female teachers	46.1
Rural schools	58.7
Received AI training	39.3

Table 2: School Infrastructure Access

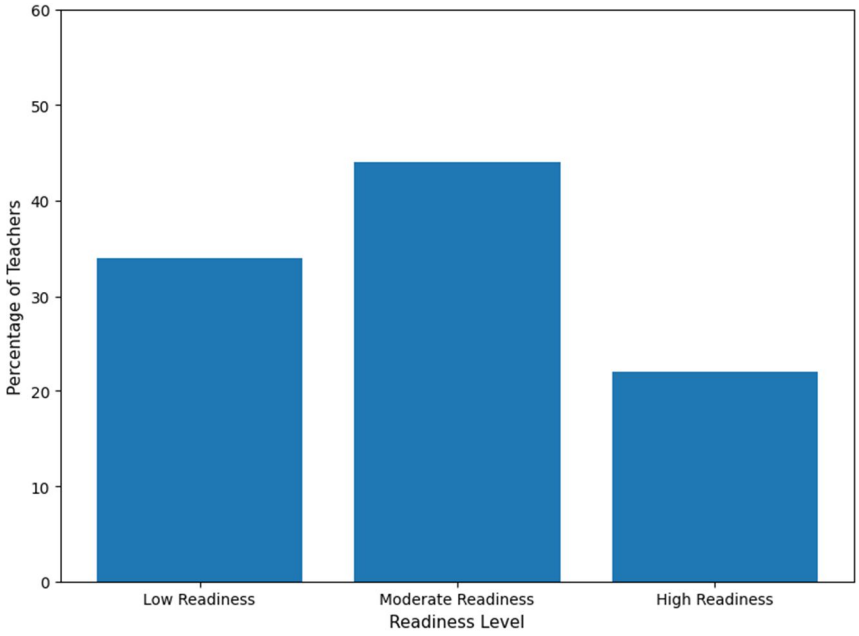
Component	Mean
Reliable electricity	0.71
Internet access	0.54
Student device access	0.42

Figure 1. AI Tool Adoption Rates Across Government Schools



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Figure 2. Teacher AI Readiness Levels



Interpretation: Teacher capacity is uneven, with many teachers reporting limited readiness.

B. Regression Analysis

Table 3. Regression Predicting Student Learning Outcomes

Variable	β	SE	t	p
AI Tool Usage	0.34	0.05	6.80	< 0.001
Infrastructure Index	0.21	0.04	5.25	< 0.001
Teaching experience	0.08	0.03	2.67	0.008

$R^2 = 0.41$

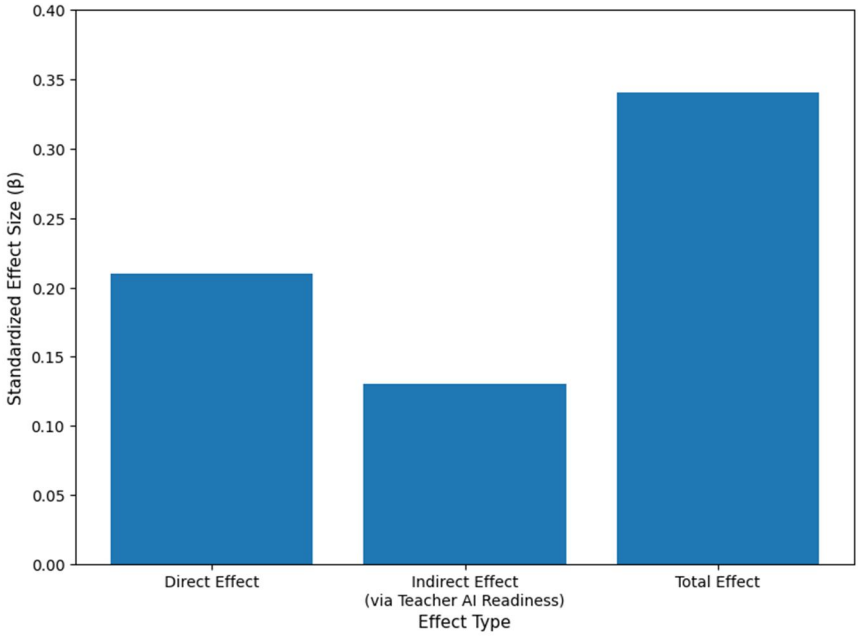
Interpretation: AI tool usage has a positive and significant association with learning outcomes. **H01 is rejected.**

C. Mediation Analysis

Effect	β	p
Direct effect	0.21	< 0.01
Indirect effect	0.13	< 0.01
Total effect	0.34	< 0.001

Teacher readiness mediates 38% of the total effect.

Figure 3. Mediation Model of AI Tool Usage and Learning Outcomes



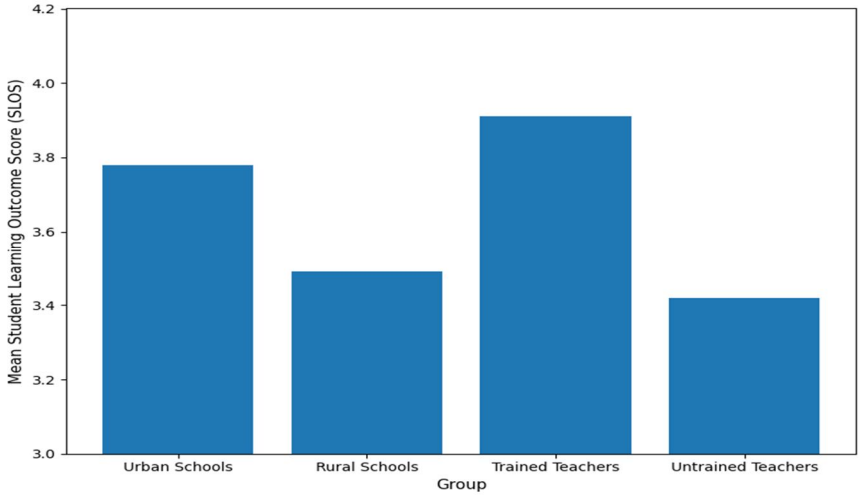
Interpretation: Teacher readiness plays a key role. H03 is rejected.

D. Group Difference Analysis

Table 5. Independent-Sample t-Tests

Comparison	Mean Difference	*p*
Urban vs Rural	0.29	< 0.01
Trained vs Untrained	0.41	< 0.001
High vs Low Infrastructure	0.37	< 0.001

Figure 4. Mean Student Learning Outcome Scores Across Groups



Interpretation: Significant differences exist. H02 is rejected.

V. DISCUSSION

The results show that AI tools can support teaching and learning in Nepal's government schools. However, their impact depends strongly on teacher readiness and infrastructure. AI does not replace teaching skills. Instead, it amplifies existing capacity.
The mediation findings confirm that teachers are the central mechanism through which AI affects learning. The group differences highlight equity concerns, especially for rural and low-infrastructure schools.

VI. CONCLUSION

This study provides empirical evidence that AI tools can improve learning outcomes in Nepal's government schools when teachers are prepared and infrastructure is adequate. Policy efforts should focus on teacher training and equitable infrastructure development rather than technology distribution alone.

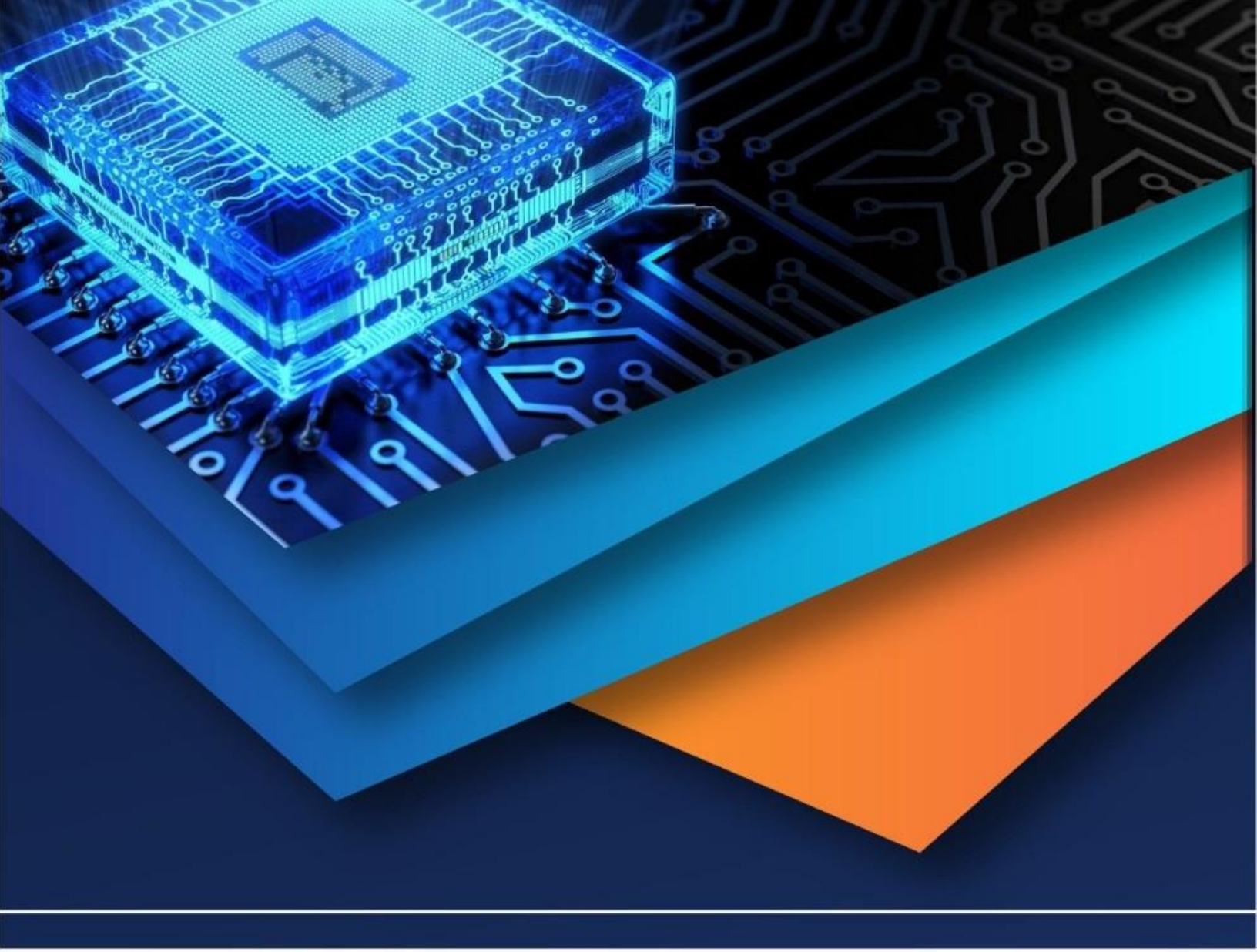
VII. LIMITATIONS AND FUTURE RESEARCH

The study uses simulated and self-reported data, which limits causal inference. Future studies should use longitudinal designs, student-level assessments, and experimental methods.

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