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IMPACT OF ARTIFICIAL INTELLIGENCE ON STUDENTS' LEARNING AND ACADEMIC PERFORMANCE

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ABSTRACT :

Artificial intelligence (AI) tools are increasingly used by students to explain concepts, summarise learning materials, practise questions, translate content and receive writing support. These uses may make learning more accessible, but they also raise concerns about inaccurate outputs, overdependence, privacy and academic integrity. This paper proposes a quantitative, cross-sectional survey to examine how school and college students use AI tools and how they perceive the relationship between such use, learning processes and academic performance. The proposed questionnaire covers educational level, frequency and purpose of AI use, verification practices, perceived conceptual understanding, independent problem-solving, study efficiency, self-reported academic performance and perceived risks. Responses will be analysed using descriptive statistics and carefully selected association tests; results may also be compared across school and college groups where the sample permits. Existing literature reports promising effects in some structured interventions, while also identifying mixed engagement patterns and methodological limitations. The intended contribution is a practical, context-specific survey framework that records both benefits and risks instead of assuming that more AI use always produces better outcomes. Data have not yet been collected for this manuscript, so it reports no respondent counts, statistical results or causal effects. Any final conclusions will be based only on approved, anonymised survey data and will distinguish perceived impact from objectively measured academic achievement.

Keywords: Artificial intelligence; student learning; academic performance; generative AI; school students; college students; digital literacy; survey research

INTRODUCTION

Artificial intelligence has become more visible in education through conversational assistants, adaptive learning platforms, automated feedback tools, language support systems and AI-enabled study applications. Students can ask questions in everyday language, request an explanation at a different level, generate practice questions, compare solution methods or receive support while drafting and revising written work. These capabilities can complement teachers and textbooks when students use them to explore ideas and check their understanding.

However, an AI-generated answer is not necessarily correct, complete or appropriate for a particular syllabus. A student may accept a confident but inaccurate explanation, submit generated work without understanding it, or become less willing to solve problems independently. Access to devices, connectivity, language support and guidance also differs among learners. UNESCO therefore recommends a human-centred approach that safeguards learner agency, inclusion, privacy and ethical use rather than treating generative AI as an automatic solution to educational challenges (Miao & Holmes, 2023).

Research findings also require careful interpretation. Experimental reviews have reported positive average learning outcomes in some contexts, but effects vary according to the task, type of AI intervention, instructional support and research design (Deng et al., 2025; Gu & Yan, 2025). Reviews of student engagement have identified both engagement and disengagement, including concerns relating to over-reliance and academic dishonesty (Lo et al., 2024). These findings support a balanced investigation of how students actually use AI, what they believe it helps them do, and what concerns they experience.

Problem Statement

AI tools are increasingly available to learners, yet the educational value of their use depends on the purpose, frequency, quality of guidance and students' ability to evaluate generated information. A simple count of AI use cannot show whether students use AI to understand a topic, verify a solution, practise independently or merely obtain a ready-made answer. A structured investigation is therefore needed to document usage patterns alongside perceived learning benefits, possible dependency and self-reported academic outcomes among school and college students. The proposed survey will explore associations in a defined sample; it will not claim that AI use alone causes a change in examination marks.

Objectives

The objectives of this study are to: (1) identify the AI tools most commonly used by school and college students for academic purposes; (2) examine the frequency and main purposes of educational AI use; (3) assess students' perceptions of AI support for conceptual understanding, revision, self-learning

and problem-solving; (4) explore the association between AI-use patterns and self-reported academic performance, while accounting for the limitations of cross-sectional data; (5) document students' verification practices and concerns regarding reliability, overdependence, privacy and academic integrity; and (6) compare selected response patterns between school and college students, where sample size and data quality allow..

Scope and Contribution

The proposed study focuses on students at school and college levels who are eligible to participate under the permissions and consent arrangements approved by the research guide and participating institutions. It covers general-purpose generative AI tools and other AI-enabled educational applications. Its practical contribution is a survey framework that examines usage, perceived learning support, verification behaviour and risks together. The study does not develop a new AI algorithm, test an AI product, or claim a measured improvement in grades. Its contribution is contextual and exploratory; it does not claim that the broader topic has never been studied.

LITERATURE SURVEY

Miao and Holmes (2023), in UNESCO's guidance for generative AI in education and research, argue for educational use that protects human agency and considers inclusion, ethics, data privacy and the ability of institutions to validate AI tools. This guidance is relevant to research design because students' experiences should be assessed alongside access, verification and responsible-use practices.

Lo et al. (2024) reviewed 72 empirical studies on ChatGPT and student engagement. Their synthesis identified evidence of both engagement and disengagement. Positive patterns included interest and perceived understanding, while concerns included academic dishonesty and possible reductions in critical thinking or self-regulation. The authors also highlighted the need for longer-term studies and more objective measures. This suggests that a survey should measure both beneficial and potentially harmful patterns instead of treating student satisfaction as proof of learning.

Deng et al. (2025) conducted a systematic review and meta-analysis of experimental studies investigating whether ChatGPT enhances student learning. Their results indicated positive average effects on academic performance and some other outcomes, but the authors noted methodological limitations and the need for stronger assessments, longer follow-up and adequate sample-size planning. Their work supports the potential usefulness of AI in structured learning activities but does not establish that every type or amount of AI use is beneficial.

Gu and Yan (2025) analysed GenAI interventions in studies that included school and college contexts. Their meta-analysis reported an overall positive effect on academic performance and found that teacher support was an important moderator in the included studies. This points to the importance of asking whether learners receive guidance on using, checking and interpreting AI outputs. Results from controlled interventions, however, should not be directly equated with everyday self-selected AI use measured through a cross-sectional questionnaire.

Adewale et al. (2024) reviewed AI adoption and academic performance in open and distance learning. Their review described varied research approaches and discussed factors that can influence adoption and outcomes. Taken together, these studies indicate that AI in education is not a single intervention: tools, learning tasks, teaching support, student background and evaluation methods can differ substantially.

Research Gap and Design Rationale

The existing literature includes experimental studies, meta-analyses, engagement reviews and research focused on particular educational settings. Therefore, it would be inaccurate to claim that the relationship between AI use and academic performance is unexplored. The present study instead proposes a context-specific survey of school and college students using a common questionnaire to record usage frequency, intended purpose, verification behaviour, perceived learning support, perceived dependency and self-reported academic outcomes. This combined view may help identify which use patterns warrant further investigation in the selected sample. Any gap claim should be refined after a documented literature search and before final submission.

PROPOSED METHODOLOGY

The proposed study follows a quantitative, cross-sectional survey approach to examine the impact of Artificial Intelligence on students' learning experiences and academic performance. The study consists of questionnaire preparation, data collection, data validation, feature construction, statistical analysis, interpretation and reporting. Figure 1 summarizes the proposed research workflow.

Data Collection and Feature Representation

The study will collect responses from school and college students using a structured questionnaire. The questionnaire will include educational level, AI tools used, frequency of usage, academic purposes, learning perceptions, self-reported academic performance, verification practices and AI-related concerns. Responses will be collected through Google Forms or a similar platform.

Before analysis, responses will be checked for eligibility, missing values, duplicate submissions and inconsistent entries. Categorical responses will be standardized, and missing values will be treated as unknown rather than assumed. Unnecessary personal identifiers will not be collected. Participation will be voluntary, and applicable consent requirements will be followed, particularly for minor students.

Table 1. Core Information for Student Survey

Feature	Example	Analytical Role
Educational level	School, College	Group comparison
AI tools	ChatGPT, Gemini, other AI tools	Identify commonly used tools
Usage frequency	Daily, Weekly, Rarely	Measure adoption patterns
Academic purpose	Revision, assignments, problem-solving	Identify major use cases
Learning perception	Understanding, self-learning	Assess perceived learning support
Academic performance	Self-reported improvement or change	Examine perceived outcomes
Verification practices	Fact-checking, source checking	Assess responsible AI use
AI-related concerns	Accuracy, privacy, dependence	Identify challenges

Data Validation and Preparation

The collected responses will be checked for completeness, eligibility and consistency. Duplicate and ineligible submissions will be handled using predefined criteria. Categorical values will be standardized, and Likert-scale responses will be coded consistently. The cleaned dataset will be prepared for statistical analysis.

Statistical Analysis

The study will use descriptive statistics, including frequencies, percentages and suitable summary measures, to examine AI usage patterns and learning perceptions. Bar charts and other relevant visualizations will present the major findings. Cross-tabulation and chi-square tests may be used for selected categorical comparisons, while Spearman's rank correlation may be considered for suitable ordinal variables.

Interpretation and Reporting

The findings will be interpreted based on students' reported experiences and collected responses. Comparisons between school and college students will be presented where the available sample supports meaningful analysis. The study will examine associations between AI usage and self-reported academic performance without claiming direct causal effects. Limitations such as convenience sampling, self-reporting bias and sample size will also be acknowledged.

Figure 1. Proposed Research Workflow

Questionnaire Preparation → Data Collection → Data Validation and Standardization → Feature Construction → Statistical Analysis → Interpretation of Findings → Research Reporting

Proposed System and Technology Requirements

The study can be conducted using Google Forms for data collection, Google Sheets or CSV for data storage, and Python with Pandas, NumPy, Matplotlib and SciPy for data processing, statistical analysis and visualization. Google Colab or Jupyter Notebook can be used as the analysis environment. These are proposed tools for conducting the study and do not indicate that data collection or analysis has already been completed.

PROPOSED CONCEPTUAL FRAMEWORK

The planned framework treats AI usage as a set of behaviours rather than a single yes/no variable. Input variables include educational level, AI access, frequency of use, tool category and academic purpose. Process variables include verification of AI-generated responses, use of AI for explanation versus answer production, and perceived independence while learning. Outcome measures include perceived understanding, study efficiency, confidence in preparing for assessments and self-reported academic performance. Potential risk indicators include overdependence, incorrect information and concerns about academic integrity.

Proposed analytical flow

Student profile and access	AI usage patterns	Verification and learning behaviour	Perceived learning outcomes	Balanced interpretation

Figure 1. Proposed survey framework. Arrows indicate the analysis sequence, not proof of cause and effect.

The analysis will compare patterns and associations while recognising that study habits, previous attainment, teacher support, motivation, socio-economic access and subject difficulty may influence both AI use and academic performance. A single cross-sectional survey cannot fully adjust for these factors or establish causality. If future work intends to test actual changes in achievement, it should consider pre/post measures, comparison groups, appropriate controls and objective outcome measures approved by the institutions.

PLANNED REPORTING AND EVALUATION

Because data collection has not yet been completed, numerical results, response rates and conclusions about the sample are intentionally not reported in this manuscript. The first evaluation stage will assess the instrument rather than claim educational impact. The pilot should verify that students understand each question, that response categories cover likely answers, that non-users can select 'not applicable' where needed, and that no item unintentionally pressures participants to report positive views of AI. The final questionnaire and any changes made after the pilot should be documented.

After the survey closes, the completed dataset should be checked against the pre-defined eligibility and missing-data rules. Results should include a participant-flow summary, a table describing the sample, tool-usage charts, perception distributions and the pre-specified association analysis. Findings should report positive, neutral and negative patterns. If results differ between school and college students, the paper should discuss alternative explanations and sample limitations rather than attributing differences automatically to educational level.

A quality review should include reproducibility checks on calculations and figures, a consistency check between reported percentages and tables, and verification that all claims are supported by the collected dataset or cited literature. A second reviewer or the guide can examine coding and interpretation. The de-identified analysis file, questionnaire version and analysis script should be retained securely according to institutional requirements.

DISCUSSION

The proposed design is intended to create a balanced picture of students' AI use. AI tools can provide quick explanations, alternative examples, language assistance and practice questions. These functions may help students begin a task or review material that they find difficult. Nevertheless, the benefit depends on whether the learner actively evaluates the output and connects it to course materials. A student may complete a task faster without necessarily developing a deeper or more durable understanding.

The inclusion of verification practices is therefore important. Students who compare generated answers with textbooks, teacher explanations or reliable sources may be better positioned to notice errors than students who accept the first response. Similarly, asking whether AI is used for explanations, practice and feedback versus direct production of assignment answers may clarify differences obscured by general questions such as 'Do you use AI?' These are questions for empirical examination; the survey must not presume their answers.

A further consideration is academic performance measurement. Self-reported perceptions of improved marks are useful as one aspect of student experience, but they are not equivalent to examination records or measured learning gains. Recall bias, differences in course difficulty and the possibility that high-performing students use AI differently can affect observed associations. Future research may combine survey data with consented objective outcomes or longitudinal measures. Until then, conclusions should use terms such as 'reported', 'perceived' and 'associated with' rather than 'caused' or 'proved'.

Potential Applications

The findings, once collected, may help teachers and institutions identify topics where students seek AI support, the types of tasks for which students find it useful, and areas where guidance is needed. Potential actions include teaching students how to verify AI-generated information, explaining acceptable forms of assistance, designing assignments that assess reasoning and process, and providing equitable access to approved learning resources. These are potential applications, not outcomes demonstrated by the present draft.

Limitations and Ethical Considerations

The proposed study has several limitations. Convenience sampling may not represent all school and college students. Self-reported AI use and academic performance can be affected by memory errors or socially desirable answers. Tool capabilities change quickly, and students may interpret 'AI tool' differently. A cross-sectional design cannot determine whether AI use causes a change in learning or marks. Comparisons across educational stages may also be affected by differences in age, curriculum, assessment and access to technology.

Ethical safeguards are essential, particularly when school students are involved. The research team should obtain the approvals required by its institution and participating schools, provide age-appropriate information, secure parent/guardian permission and student assent where applicable, and allow voluntary withdrawal. Survey settings should minimise collection of identifiable information. Raw data should be stored securely, access should be limited to the research team, and results should be presented in aggregate form. The questionnaire must not ask participants to disclose passwords, private account details or confidential academic records. Any use of direct quotations from open-ended responses must avoid identifying the respondent.

CONCLUSION AND FUTURE WORK

This manuscript outlines a proposed survey-based study of the impact of artificial intelligence on students' learning and academic performance, focusing on school and college students. The design connects AI-use patterns with perceived conceptual understanding, study practices, self-reported academic outcomes, verification behaviour and concerns about overdependence and academic integrity. The literature indicates possible benefits in some instructional contexts alongside mixed engagement findings and important methodological cautions.

No empirical result is claimed because the survey has not yet been conducted. The next steps are to obtain guide and institutional approval, pilot and finalise the questionnaire, collect consented responses, perform a pre-specified analysis and report both positive and negative findings transparently. Future work could extend the study through repeated measurements, comparisons across subjects or educational stages, and consented objective performance indicators. Only after those steps should the results and conclusion be finalised for journal submission.

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