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Role of Artificial Intelligence on Students' Critical Thinking Skills at the University of Narowal

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ARTICLE INFO	ABSTRACT
Submission: August 04, 2026 Revised: August 25, 2026 Accepted: September 08, 2026 Available Online: September 19, 2026 Keywords: Artificial Intelligence, critical thinking, higher education, university students, AI tools, ChatGPT, University of Narowal. Corresponding author: Dr. Rukhsana Sardar Email: rukhsana.sardar@uon.edu.pk	Artificial Intelligence (AI) is increasingly becoming part of university education. Students use AI tools for searching information, generating ideas, improving language, summarizing academic material, and receiving assistance with different learning tasks. This study examined the role of Artificial Intelligence in relation to students' critical thinking skills at the University of Narowal. A quantitative descriptive survey design was adopted. Data were collected from 340 students through the AI Tools and Critical Thinking Questionnaire.(AIT-CTQ), using a five-point Likert scale. The data were analyzed through SPSS Version 26 using descriptive statistics, reliability analysis, Pearson correlation, regression analysis, and one-way ANOVA as appropriate. The findings showed a strong positive and statistically significant relationship between AI use and critical thinking ($r = .737$, $p < .001$). Regression analysis also indicated a statistically significant association between AI use and reported critical thinking ($\beta = .737$, $p < .001$), with $R^2 = .544$. Because the study used a descriptive survey design, the results should not be interpreted as proof of causation.

Introduction

The Artificial Intelligence has rapidly become an important technology in higher education. AI-based applications can support students in finding information, generating ideas, improving written language, obtaining explanations, and organizing academic work. The development of generative AI has particularly increased students' access to tools that can respond to questions and produce human-like text. Research on AI in higher education has identified applications in learning support, assessment, profiling, and intelligent tutoring (Zawacki-Richter et al., 2019).

The growing availability of AI tools creates both opportunities and responsibilities. When students use AI to obtain an explanation of a difficult concept or to explore alternative ideas, the technology may support learning. However, students still need to check the accuracy and relevance of information produced by AI. UNESCO guidance emphasizes that generative AI in education should be used in a human-centred, ethical, safe, and meaningful way (Miao & Holmes, 2023).

Critical thinking is especially important in this context. University students are expected to interpret information, analyze arguments, evaluate evidence, draw conclusions, and explain their reasoning. Facione (1990) identifies interpretation, analysis, evaluation, inference, explanation, and self-regulation as important components of critical thinking.

Background of the Study

The rapid development of AI has changed the way students interact with academic information. Applications such as ChatGPT, Grammarly, Gemini, and other AI tools can provide immediate assistance. Such tools may support learning when students use them to obtain explanations, generate ideas, receive language support, or explore alternative perspectives. A systematic review by Labadze et al. (2023) reported potential benefits of AI chatbots for personalized assistance, information access, and learning support.

At the same time, AI-generated responses may contain inaccurate or incomplete information. Students therefore need digital and critical literacy skills to assess AI outputs. Responsible use requires students to verify important information and maintain their own analytical judgment.

Statement of the Problem

The increasing use of AI tools among university students creates a need to understand how such use is related to critical thinking. AI can provide rapid answers and academic assistance, but students may also rely heavily on generated information without independently evaluating it. The problem addressed in this study is therefore the relationship between students' AI use and their critical thinking skills at the University of Narowal.

Objectives of the Study

- To examine differences in critical thinking between AI users and non-users.
- To identify critical-thinking dimensions supported or affected by AI.
- To explore whether students perceive AI as helpful or harmful in learning.

Research Questions

1. What is the relationship between AI use and students' critical thinking skills?
2. What critical-thinking dimensions are supported or affected by AI use?
3. Do students perceive AI as helpful or harmful in their learning?

Significance of the Study

Students. The study may help students understand the importance of using AI tools responsibly. Students can use AI for support while continuing to analyze information, verify answers, compare viewpoints, and make independent judgments.

Teachers. The findings may help teachers understand how students are using AI tools. Teachers may develop assignments that require analysis, evaluation, reflection, discussion, and justification.

University Administration. The study may provide evidence for developing guidance and awareness programs concerning responsible AI use, academic integrity, digital literacy, and classroom practices.

Researchers. The study may provide a basis for future research on AI use, critical thinking, learning outcomes, and responsible technology use in higher education.

Scope of the Study

The study focused on students at the University of Narowal and examined AI use in relation to reported critical thinking skills. The study used quantitative survey data and focused on measurable patterns in the responses of the selected participants.

Literature Review

Artificial Intelligence in higher education has developed into a broad research area. Zawacki-Richter et al. (2019) systematically reviewed research on AI applications in higher education and identified areas including assessment, adaptive systems, intelligent tutoring, and student support. Their review also emphasized the importance of educators and pedagogical considerations.

Artificial Intelligence and Student Learning

AI tools can provide students with rapid access to explanations and examples. Chatbots may answer questions in conversational language, while writing-support tools can identify language problems and suggest improvements. Labadze et al. (2023) identified potential benefits including personalized learning support and immediate assistance.

However, AI-generated responses may contain inaccurate, incomplete, or misleading information. Students therefore need digital and critical literacy skills to assess AI outputs. UNESCO guidance emphasizes human agency, ethical considerations, privacy, and appropriate educational use (Miao & Holmes, 2023).

AI and Critical Thinking

Critical thinking is a multidimensional ability. Facione (1990) describes core skills including interpretation, analysis, evaluation, inference, explanation, and self-regulation. In academic settings, critical thinking enables students to distinguish evidence from unsupported claims and reach conclusions based on reasoning.

The relationship between AI and critical thinking can therefore be understood in different ways. AI may support critical thinking when students use it to compare explanations, identify alternative arguments, test ideas, or obtain feedback. Conversely, uncritical reliance on AI-generated answers may reduce opportunities to practice independent reasoning.

Review of Related Empirical Work

Montenegro-Rueda et al. (2023) conducted a systematic review of the implementation of ChatGPT in education. Their review highlighted possible benefits of ChatGPT but also identified challenges related to academic use, assessment, and the need for teachers and institutions to adapt educational practices.

Labadze et al. (2023) reported that AI chatbots can support learning by providing explanations, personalized assistance, and quick responses. Their review also emphasized the need to address limitations and ensure appropriate integration.

Andreucci-Annunziata et al. (2023) reviewed research on critical thinking in higher education and emphasized instructional approaches that actively develop students' analytical and evaluative abilities. This literature is relevant to AI because students need opportunities to practice critical thinking even when digital tools are available.

Conceptual Perspective

The present study considers AI use as an academic technology-related variable and critical thinking as an important learning-related outcome. The relationship between the variables is examined statistically through correlation and regression. The study does not assume that a statistical relationship automatically demonstrates a causal effect.

Research Gap

Although international literature on AI and education is growing, context-specific evidence remains important. Students in different institutions may have different levels of access, patterns of use, and expectations. The present study contributes local empirical evidence by examining students at the University of Narowal.

Methodology

Research Design

A quantitative descriptive survey research design was used. This design was suitable because the study aimed to collect standardized responses from students and examine patterns and statistical relationships among variables.

Population

The population consisted of students of the University of Narowal. The population provided the context in which students' use of AI tools and reported critical thinking could be examined.

Sample

The study included 340 valid respondents. The final sample represented students whose completed questionnaires were available

for statistical analysis.

Sampling Technique

Stratified random sampling was used. The purpose of stratification is to organize a population into relevant groups and select participants in a way that can provide representation across those groups.

Instrument

Data were collected through the AI Tools and Critical Thinking Questionnaire (AIT-CTQ). The questionnaire used a five-point Likert-type response format and obtained information related to students' use of AI and reported critical thinking.

Data Collection

The questionnaire was administered to selected students. Completed questionnaires were collected and prepared for data entry and statistical analysis.

Data Analysis

The collected data were analyzed using SPSS Version 26. Descriptive statistics were used to summarize respondent information and AI-use patterns. Reliability analysis was used as appropriate for questionnaire data. Pearson correlation was used to examine the direction and strength of relationships. Regression analysis was used to examine the statistical predictive relationship between AI use and reported critical thinking.

One-way ANOVA was included among the statistical procedures used as appropriate.

Statistical Significance

For inferential statistical tests, $p < .05$ was treated as the conventional criterion for statistical significance. A p-value below .05 indicates that the observed statistical result is unlikely under the null hypothesis at that significance level. In the reported correlation and regression results, $p < .001$, which is below .05; therefore, those results are statistically significant.

Statistical significance should be distinguished from practical importance and causation. A statistically significant association does not by itself demonstrate that one variable causes another. Because the present study used a descriptive survey design, the findings are interpreted as relationships and statistical predictions rather than causal effects.

Results and Findings

AI Use Among Respondents

AI Use	Frequency	Percentage
AI users	318	93.5%
Non-users	22	6.5%
Total	340	100%

The results show that 318 respondents (93.5%) reported using AI tools, while 22 (6.5%) reported not using them. This indicates that AI use was common among respondents.

Most-Used AI Tools

AI Tool	Frequency	Percentage
ChatGPT	275	80.9%
Grammarly	30	8.8%

Gemini	9	2.6%
Other AI tools	26	7.6%
Total	340	100%

ChatGPT was the most frequently reported AI tool, followed by Grammarly, Gemini, and other AI tools. The distribution indicates that respondents used different AI applications, although ChatGPT accounted for the largest share.

Pearson Correlation

Variables	r	p-value	Significance
AI Use – Critical Thinking	.737	< .001	Statistically Significant
AI Use – Negative Effects	.381	< .001	Statistically Significant
Critical Thinking – Negative Effects	.405	< .001	Statistically Significant

The correlation between AI Use and Critical Thinking was $r = .737$ with $p < .001$. This represents a strong positive statistical relationship. Because $p < .05$, the relationship is statistically significant.

The relationship between AI Use and Negative Effects was $r = .381$ with $p < .001$. The relationship between Critical Thinking and Negative Effects was $r = .405$ with $p < .001$. Both relationships were statistically significant.

These correlation results indicate associations among the variables. They should not be interpreted as evidence that AI use causes higher or lower critical thinking.

Regression Analysis

Predictor	B	β	t	R ²	p-value	Significance
AI Use	.905	.737	20.075	.544	< .001	Statistically Significant

The regression model showed a statistically significant association between AI Use and reported Critical Thinking ($\beta = .737$, $t = 20.075$, $p < .001$). The R^2 value was .544, indicating that the model accounted for 54.4% of the variance in reported critical thinking within the sample.

The standardized coefficient ($\beta = .737$) indicates a positive statistical relationship between AI Use and the reported Critical Thinking measure. The significance value of $p < .001$ is below the .05 criterion, so the regression result is statistically significant.

The regression result should be interpreted carefully. The model identifies a statistical predictive relationship within the observed data, but the study design does not permit a causal conclusion. Other factors may contribute to students' critical thinking.

Summary of Major Findings

The first major finding was that AI use was common among respondents, with 93.5% reporting AI use. The second finding was that ChatGPT was the most frequently reported tool. The third finding was a strong positive and statistically significant relationship between AI Use and Critical Thinking. The fourth finding was that AI Use, Critical Thinking, and Negative Effects showed statistically significant relationships. Finally, regression analysis showed a statistically significant predictive relationship between AI Use and reported Critical Thinking, with $R^2 = .544$.

Discussion

The results indicate that AI tools were widely used by students in the sample. The high percentage of reported AI users reflects the growing presence of AI in academic activities. This is consistent with literature showing that AI applications are increasingly examined as tools for learning support in higher education.(Zawacki-Richter et al., 2019; Labadze et al., 2023).

The most frequently reported tool was ChatGPT. Conversational generative AI can provide responses to a wide range of academic

questions. However, frequency of use does not establish whether students used the tool effectively. The quality of educational use depends on students' purposes, prompts, verification practices, and engagement with the material.

The strong positive correlation between AI Use and Critical Thinking was statistically significant. This suggests that, in this sample, higher reported AI use was associated with higher reported critical thinking scores. One possible interpretation is that students who use AI as a learning support may also engage in activities involving questioning, comparison, and evaluation. Other explanations are also possible, and the present study cannot determine causality.

The statistically significant relationship between AI Use and Negative Effects indicates that AI use and perceived negative effects were related in the sample. This supports the view that AI adoption can involve both opportunities and challenges.

UNESCO guidance emphasizes human agency and responsible educational use (Miao & Holmes, 2023). Research reviews similarly emphasize appropriate pedagogical integration rather than treating AI as a replacement for teachers or students' own reasoning (Labadze et al., 2023; Montenegro-Rueda et al., 2023).

Discussion of Critical Thinking

Critical thinking is particularly relevant to AI-supported learning because AI can produce information quickly but cannot remove the student's responsibility to evaluate that information. Facione (1990) emphasizes analysis, evaluation, inference, explanation, and self-regulation as central elements of critical thinking.

Students who use AI critically may ask follow-up questions, compare AI responses with course materials, identify unsupported claims, and modify responses based on evidence. These practices can make AI a support for active learning rather than a substitute for independent thinking.

Comparison with Previous Research

The findings are broadly consistent with literature reporting that AI chatbots may provide educational support and personalized assistance (Labadze et al., 2023). They also align with systematic research showing that AI applications have become a significant topic in higher education (Zawacki-Richter et al., 2019). However, the present findings should not be treated as universal because the sample was drawn from one university.

Research on critical thinking emphasizes that active instructional strategies are important for developing students' reasoning abilities (Andreucci-Annunziata et al., 2023). This supports the recommendation that teachers should design AI-supported assignments that require students to explain their reasoning, evaluate evidence, and reflect on AI-generated information.

Implications for Teaching and Learning

Teachers may use AI as an opportunity to strengthen critical-thinking activities. For example, students can be asked to generate an AI response and then identify its strengths, weaknesses, unsupported statements, and missing evidence. They can compare AI-generated answers with textbooks or scholarly sources and explain which claims are better supported.

Such activities shift the focus from simply obtaining an answer to evaluating the quality of an answer. This can help students develop digital literacy, information evaluation, and independent reasoning while still benefiting from AI assistance.

Conclusion

The study examined the role of Artificial Intelligence in relation to students' critical thinking skills at the University of Narowal. The findings showed that AI use was common among respondents, with 93.5% reporting AI use. ChatGPT was the most frequently reported AI tool.

The statistical analysis showed a strong positive and statistically significant relationship between AI Use and Critical Thinking ($r = .737, p < .001$). Regression analysis also showed a statistically significant predictive relationship ($\beta = .737, p < .001$), with $R^2 = .544$. The study therefore provides evidence of a strong association between AI use and reported critical thinking in the selected sample.

At the same time, the findings should be interpreted within the limitations of the research design. The study used self-reported survey data from one university and therefore cannot establish that AI use caused changes in critical thinking.

Recommendations

- Students should use AI tools as learning support while maintaining independent analysis, evaluation, and judgment.
- Students should verify important AI-generated information through reliable academic sources.
- Teachers should design assignments that require students to explain, compare, evaluate, and justify their answers.
- Universities should provide guidance about responsible and academically appropriate AI use.
- Teachers may use AI-generated responses as material for critical-analysis exercises.
- Future researchers should consider larger samples and multiple universities.
- Longitudinal or experimental research may be conducted to examine changes in critical thinking over time.

Limitations and Future Research

The first limitation is that the study was conducted at one university. Students at other universities may have different patterns of AI access, academic requirements, and technology use. Therefore, the findings should not automatically be generalized to all university students.

The second limitation is the use of self-reported questionnaire data. Students' reported AI use and critical thinking may differ from their actual behavior. Future studies may combine questionnaires with performance-based measures, interviews, observation, or analysis of students' academic tasks.

The third limitation is the cross-sectional survey design. Data were collected within a particular study period, so the design cannot establish how AI use and critical thinking change over time. Longitudinal research could examine whether students' patterns of AI use and critical thinking develop as they gain more experience with AI.

Future research may compare different academic disciplines, levels of study, and types of AI tools. Researchers may examine whether guided use, independent use, or frequent use produces different learning patterns. Experimental research could test particular AI-supported teaching strategies and measure their effects on critical-thinking performance.

Overall Findings in Brief

Area	Main Result
AI Use	318 students (93.5%) reported AI use.
Most-used tool	ChatGPT: 275 students (80.9%).
AI Use & Critical Thinking	$r = .737, p < .001$; statistically significant.
AI Use & Negative Effects	$r = .381, p < .001$; statistically significant.
Critical Thinking & Negative Effects	$r = .405, p < .001$; statistically significant.
Regression	$\beta = .737, t = 20.075, p < .001; R^2 = .544$.

Overall, the evidence indicates strong statistical associations between AI use and the reported critical-thinking measure. The results provide a basis for further investigation of how AI can be incorporated into university learning while preserving independent reasoning.

Summary

This research article examined the role of Artificial Intelligence on students' critical thinking skills at the University of Narowal. The study used a quantitative descriptive survey approach with 340 respondents. Data were collected through the AI Tools and Critical Thinking Questionnaire and analyzed using SPSS Version 26.

The results showed that AI use was widespread among respondents. Most respondents reported using AI tools, and ChatGPT was

the most frequently reported application. Pearson correlation analysis showed a strong positive and statistically significant relationship between AI Use and Critical Thinking. Regression analysis also showed a statistically significant relationship, with the model accounting for 54.4% of the variance in reported critical thinking.

The study highlights the importance of responsible and purposeful AI use in higher education. AI can provide useful academic support, but students should continue to evaluate information, check evidence, and make independent judgments. Teachers can support this process by designing assignments that make critical analysis an essential part of AI-supported learning.

Finally, the findings should be interpreted within the study's limitations. The sample was drawn from one university, the data were self-reported, and the descriptive survey design does not establish causation. Future research using larger samples, multiple institutions, longitudinal designs, and performance-based measures may provide a more complete understanding of the relationship between AI use and critical thinking.

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