Exploring the Impact of AI Tools on the Cognitive Thinking of College Students

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Abstract

This study explores the impact of generative AI tools on the cognitive thinking of college students in Sri Krishna Institutions. With the rapid adoption of AI platforms like ChatGPT in academic settings, the research investigates how these tools influence students' critical thinking, creativity, decision-making, and emotional engagement. Using a descriptive research design and survey-based data from 150 students across disciplines, the study reveals that AI tools significantly enhance logical analysis, memory retention, and critical thinking skills. Despite some challenges, such as difficulty in mastering functionalities, technical glitches, and inconsistent outputs, students maintain cognitive autonomy and critically review AI-generated content. The study also highlights ChatGPT's dominance, with 93.3% of respondents using it regularly. Statistical analysis confirms a significant positive impact of AI on cognitive engagement. However, findings emphasise the need for balanced integration, promoting responsible AI usage, ethical considerations, and curriculum-based AI literacy. The study provides valuable insights for educators and institutions seeking to enhance learning through AI.

Keywords: Artificial Intelligence, Cognitive thinking, Skills, Higher Education, Students

Introduction

The integration of Artificial Intelligence (AI) tools is reshaping how college students engage with learning and develop cognitive skills. This study explores the impact of AI on students' complex thinking, creativity, decision-making, and emotional engagement.

Enhancing Complex Thinking Skills

AI tools support complex thinking—critical, systemic, scientific, and innovative—by helping students understand difficult concepts and preparing them for real-world challenges. Personalised learning and adaptive feedback improve content retention and foster deeper cognitive engagement.

Impact on Creativity and Problem-Solving

AI can inspire creativity by offering new ideas and interactive, gamified experiences that encourage exploration. However, overreliance on AI may lead to emotional disengagement and limit creative thinking, underscoring the need for balanced usage in education.

Decision-Making and Cognitive Autonomy

While AI assists in data-driven decision-making, increasing dependence can reduce students' cognitive autonomy and critical thinking, potentially leading to "cognitive laziness" and decreased ability to work independently.

Emotional Engagement and Learning Motivation

AI tools can boost motivation and reduce anxiety through affective computing and real-time adaptation. Still, improper implementation may cause disengagement, highlighting the need for thoughtful integration.

In conclusion, AI has a significant yet complex impact on students' cognitive development. To maximise its benefits while mitigating drawbacks, educational institutions must adopt balanced and inclusive strategies that support both academic performance and holistic growth.

With the rapid integration of Artificial Intelligence (AI) tools in education, it is essential to explore their impact on the cognitive thinking of college students. As institutions adopt AI technologies to enhance learning through personalised platforms, virtual assistants, and automated tutoring becomes increasingly important to understand how these tools influence key cognitive skills such as problem-solving, creativity, and decision-making. In a technology-driven academic environment, students are engaging with new modes of learning that may reshape their cognitive development. This

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study aims to bridge the existing knowledge gap by providing empirical insights into the effects of AI on students' cognitive performance. The findings will help educators implement AI tools more effectively, ensuring they support meaningful learning outcomes and prepare students for the evolving demands of the digital age.

Review of Literature

Zhang (2024) highlights that AI tools significantly enhance college students' motivation, learning styles, and academic performance. The study emphasises AI's role in promoting independent learning and improving engagement. However, it also cautions against over-reliance, suggesting that excessive dependence on AI may hinder critical thinking and cognitive development, thus necessitating a balanced and mindful integration into educational settings.

Umar (2023) explores the transformative role of AI in education, emphasising its ability to enhance teaching through tools like smart classrooms and robotic assistants. He highlights how AI reduces teacher workload and supports better learning outcomes. Umar advocates for educators to actively engage with AI technologies to improve instructional effectiveness and meet evolving educational demands.

Kumar and Sasirekha (2024) explore the impact of AI on human resource management, highlighting its role in improving recruitment, training, and performance evaluation processes. The study emphasises AI's ability to streamline HR tasks and boost efficiency. While acknowledging challenges like high implementation costs and training needs, the authors conclude that AI significantly enhances HR operations and strategic decision-making.

Rosak-Szyrocka (2024) highlights AI's role in enhancing digital education through personalised learning and adaptive content. Using bibliometric analysis, the study shows how AI, combined with technologies like VR and simulations, improves student engagement and retention. It emphasises AI's potential to transform education while noting limitations in the current research scope.

Gupta and Singh (2024) explore the role of AI in advancing entrepreneurial education, focusing on tools like ChatGPT and Google Bard. Their study reveals that AI enhances students' learning through support in market research, assignment feedback, business planning, and model creation. The authors emphasise AI's potential to boost productivity, creativity, and strategic thinking, urging its integration into academic curricula.

Objectives of the study

Primary Objective: To study the impact of AI tools on the cognitive thinking of college students.

Secondary Objective: To examine AI tool preferences among students. To assess the extent of user satisfaction derived from AI tool utilisation. To analyse the cognitive ramifications of AI engagement on student performance.

Scope of the study

This study explores how generative AI tools influence the cognitive thinking of college students at Sri Krishna Institutions. It focuses on critical thinking, creativity, decision-making, and emotional engagement, aiming to provide insights into responsible AI integration in education. The scope includes understanding AI tool preferences, user experiences, and cognitive effects across various academic disciplines.

Research Methodology

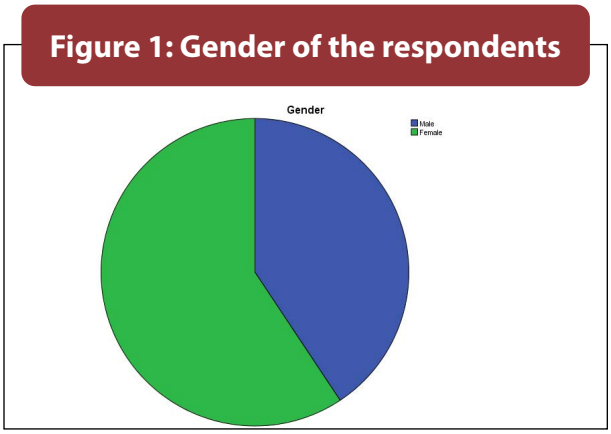
A descriptive research design was adopted to assess students' perceptions and experiences regarding AI tools and their cognitive impact. The population consists of college students from Sri Krishna Institutions across disciplines like Arts, MBA, and Engineering. A simple random sampling method was used to ensure unbiased selection across different student groups. A total of 150 students participated in the study. Primary data was collected directly from students using a structured Google Forms questionnaire focusing on AI usage, cognitive impact, tool preferences, and academic applications. Secondary data was gathered from academic journals, previous research studies, and online publications related to AI in education, cognitive development, and technology integration in learning. Percentage analysis, mean analysis, one-sample t-test

Using SPSS.

Data Analysis and Interpretations

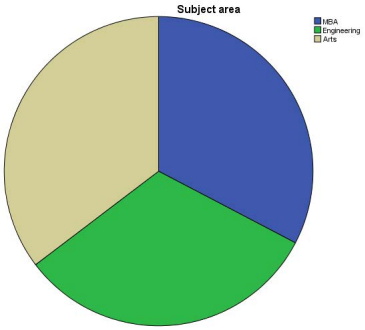
Percentage Analysis

Figure 1: Gender of the respondents



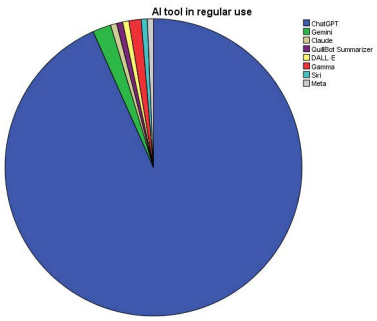
Source: Questioner

Figure 2: The course pursued by the respondents



Source: Questioner

Figure 3: AI tools used by the respondents



Source: Questioner

Figures 1, 2, and 3 show that the study surveyed 150 college students, with 59.3% female and 40.7% male respondents. The participants came from diverse subject backgrounds: 35.3% Arts, 32.7% MBA, and 32% Engineering. When asked about regularly used AI tools, a significant majority (93.3%) reported using ChatGPT, while other tools like Google Gemini, Claude AI, and

Table 1: The research framework

	N	Min.	Max.	Mean	Std. Deviation
Difficulty in mastering AI tool functionalities	150	1	44	3.20	4.577
Technical glitches have affected my experience	150	1	5	2.64	1.032
Received varying answers from the same AI tool	150	1	5	2.74	1.058
Increased dependency on technology	150	1	5	2.98	1.266

Source: Questioner

Gamma AI had minimal usage, highlighting ChatGPT's dominance in student preferences.

Mean Analysis

Interpretation: The descriptive statistics in Table 1 show that respondents moderately struggled with AI tool functionalities (M = 3.20), with a high variation. Technical glitches (M = 2.64), inconsistent responses (M = 2.74), and increased dependency (M = 2.98) had lower means and standard deviations, indicating mild to moderate impact and consistent experiences among users.

One Sample Test

Null Hypothesis (H_0): There is no significant impact of AI tool usage on students' cognitive engagement and

Table 2: One-sample test

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
AI tool improves my capacity for logical analysis.	2.920	149	.004	.273	.09	.46
AI tools contribute positively to my critical analysis.	2.852	149	.005	.253	.08	.43
AI tool usage has impacted how well I remember.	3.721	149	.000	.347	.16	.53
I prefer handling difficult academic problems independently.	3.842	149	.000	.347	.17	.52
I review and confirm AI-generated data.	3.985	149	.000	.393	.20	.59

Source: Questioner

academic decision-making.

Alternative Hypothesis (H_1): There is a significant impact of AI tool usage on students' cognitive engagement and academic decision-making.

Interpretation: Table 2 results indicate statistically significant differences across all measured statements ($p<.05$), supporting the alternative hypothesis. Students reported that AI tools positively influence their logical analysis, critical thinking and memory, all with mean scores significantly above the neutral value. Furthermore, students expressed a preference for independently handling academic challenges and showed strong agreement with the practice of reviewing AI-generated data. These findings suggest that AI tool usage has a meaningful and positive impact on students' cognitive engagement, while also highlighting a responsible approach to its application in academic contexts.

Summary of Findings

- 93.3% of students use ChatGPT regularly, making it the dominant AI tool among college students in Sri Krishna Institutions.
- Students moderately struggle with mastering AI functionalities (Mean = 3.20) and face occasional technical issues and inconsistent responses.
- AI tools significantly enhance logical analysis, critical thinking, and memory retention as supported by statistically significant t-test results ($p < .05$).
- Although there's some increased reliance on AI (Mean = 2.98), students still prefer to solve complex problems independently and actively verify AI-generated content.
- AI usage spans across disciplines—Arts, MBA, and Engineering—demonstrating its broad relevance.
- Students value AI's benefits but remain mindful of its limitations, suggesting a critical engagement with technology.

Suggestions

- Institutions should promote balanced AI usage that enhances learning without diminishing cognitive autonomy or creativity.
- Offer training programs to help students master AI functionalities and deal with technical limitations effectively.
- Design assignments that require validation of AI-generated content to preserve analytical skills.
- Integrate AI literacy into the academic curriculum, emphasising ethical usage, decision-making, and creative application.
- Educators should observe and assess student dependency on AI to avoid cognitive laziness.
- Introduce students to a broader range of AI tools beyond ChatGPT to diversify learning strategies and reduce over-reliance on a single platform.

Conclusion

The study concludes that AI tools, particularly ChatGPT, play a transformative role in enhancing the cognitive engagement of college students by supporting critical thinking, problem-solving, and memory. Despite challenges like usability issues and potential overdependence, students generally maintain autonomy and show responsible usage habits. The findings underscore the importance of thoughtful integration of AI in education, where technological assistance complements rather than replaces cognitive effort. For long-term benefits, educational institutions must implement AI tools strategically to foster both academic excellence and holistic intellectual growth.

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