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The Effect of Chatgpt on the Critical Thinking Skills of Secondary Students: A Survey-Based Study

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Abstract

The integration of artificial intelligence (AI) in education has transformed learning, prompting questions about its impact on students' cognitive development. This study examines the effect of ChatGPT on secondary students' critical thinking skills using a quantitative descriptive survey approach. The research aimed to assess ChatGPT's role in fostering critical thinking, analyze student perceptions, and identify associated challenges and opportunities. A structured questionnaire was administered to 300 secondary students, employing a five-point Likert scale to evaluate perceptions and experiences. Descriptive and inferential statistics, including mean scores, standard deviation, t-tests, and ANOVA, were used for data analysis. Findings indicate that 68% of students perceive ChatGPT as beneficial for enhancing critical thinking, 23% remain neutral, and 9% believe it has minimal impact. The mean score of 3.85 (SD = 0.76) suggests a generally positive perception. Students who frequently used ChatGPT for academic purposes showed a 15% improvement in critical thinking assessment scores. T-tests revealed significant differences in perceptions between regular and infrequent users ($t(298) = 4.52$, $p < 0.001$), while ANOVA results ($F(2, 297) = 6.78$, $p < 0.01$) indicated that senior students viewed ChatGPT more favorably than juniors. Pearson's correlation ($r = 0.52$, $p < 0.001$) demonstrated a moderate positive relationship between engagement with ChatGPT and perceived critical thinking development. Students valued ChatGPT's ability to provide instant feedback and

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multiple perspectives but raised concerns about over-reliance and misinformation. The study concludes that ChatGPT can enhance critical thinking if integrated strategically with structured learning.

Keywords: ChatGPT, Critical Thinking, Secondary Students, Artificial Intelligence, Education Technology, AI in learning, Survey Study

Introduction

The advent of artificial intelligence (AI) has significantly transformed various sectors, including education. AI-powered tools have revolutionized teaching and learning methodologies by providing personalized and adaptive learning experiences (Zawacki-Richter et al., 2019). Among the AI tools, ChatGPT—a language model developed by OpenAI—has garnered attention for its potential applications in educational settings. ChatGPT's ability to generate human-like text enables interactive learning experiences, offering personalized assistance to students. The tool facilitates dynamic engagement with content, allowing students to explore concepts, receive instant feedback, and develop problem-solving skills (Dwivedi et al., 2023).

Critical thinking is a fundamental skill in modern education, fostering students' ability to analyze, evaluate, and synthesize information to make informed decisions (Paul & Elder, 2019). Traditional pedagogical approaches have long emphasized the importance of critical thinking in preparing students for academic and professional success. However, with the increasing integration of AI tools in education, questions have arisen about the extent to which technologies like ChatGPT can support or hinder the development of critical thinking skills among students. Recent studies suggest that AI-driven platforms can enhance students' cognitive abilities by promoting inquiry-based learning, encouraging deeper engagement with content, and refining their analytical thinking processes (Kasneci et al., 2023).

The use of ChatGPT in educational settings has sparked debates among educators and researchers. Some scholars argue that AI chatbots can act as virtual tutors, fostering critical thinking by prompting students to ask questions, justify their reasoning, and explore alternative perspectives (Holmes et al., 2022). On the other hand, concerns have been raised about potential overreliance on AI-generated responses, which might lead to a decline in students' independent thinking skills and analytical reasoning (Mollick & Mollick, 2023). Despite these concerns, there is a growing recognition of the potential benefits of AI in

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education, particularly in enhancing students' engagement and cognitive development.

Given this context, this study investigates the effect of ChatGPT on the development of critical thinking skills among secondary students. Specifically, it examines how students engage with ChatGPT as a learning tool, analyzes their perceptions regarding its usefulness in fostering critical thinking, and identifies the challenges and opportunities associated with integrating AI chatbots in secondary education. By conducting a survey-based study, this research aims to provide empirical insights into the evolving role of AI in modern classrooms and its implications for pedagogy.

Literature Review

Chatgpt And Critical Thinking Skills

Critical thinking is a vital educational skill that involves analyzing, evaluating, and synthesizing information. It contributes to students' ability to solve problems, reason logically, and make informed decisions (Paul & Elder, 2019). With the growing presence of artificial intelligence (AI) in education, there is increasing interest in understanding how AI-powered tools, such as ChatGPT, influence students' critical thinking development. AI chatbots in learning environments create new avenues for student engagement, self-directed inquiry, and analytical reasoning (Kasneci et al., 2023).

Research has explored how AI tools like ChatGPT can enhance critical thinking skills. A study conducted at Georgia Gwinnett College integrated ChatGPT into introductory chemistry courses, where students participated in structured activities, including account setup, essay creation, and output revision. Findings indicated that students gained confidence in asking insightful questions, critically analyzing information, and understanding complex concepts. They also reported that ChatGPT offered diverse perspectives and challenged their existing thought processes, suggesting its potential to cultivate critical thinking skills in higher education (Morrison et al., 2023). Such findings support the idea that AI-driven interactions can deepen student engagement with learning material, refining their reasoning abilities.

Similarly, research involving Italian students examined the link between AI attitudes, engagement, knowledge acquisition, and critical thinking. The study found that interacting with AI-based chatbots like ChatGPT can be an effective means of developing students' critical thinking skills. It emphasized the need for educational approaches that encourage active participation and in-depth

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understanding to help students critically analyze AI-generated information (Di Domenico et al., 2025). These insights highlight the role of AI tools in stimulating cognitive development by prompting students to question, evaluate, and interpret information rather than passively consuming it.

Beyond critical thinking, ChatGPT has also been studied for its impact on problem-solving and creativity. A study involving 515 participants examined how ChatGPT interactions influenced these cognitive abilities, revealing mixed perspectives. While some participants reported significant improvements in problem analysis and creative thinking, others found minimal effects. Notably, a correlation emerged between enhanced critical thinking and subsequent improvements in problem-solving, creativity, and overall learning strategies. The study emphasized the importance of using AI responsibly, favoring guidance over direct solutions, and involving instructors in AI-assisted learning. These findings underscore ChatGPT's potential as a supplementary educational tool that complements traditional teaching methods while ensuring that students remain actively engaged in critical thinking processes (Qawqzeh, 2024).

Students' Perceptions of Using Chatgpt

The perception of students regarding ChatGPT as a tool for enhancing critical thinking varies significantly. Recent data from the Pew Research Center highlights a substantial rise in teenage use of ChatGPT, increasing from 13% in 2023 to 26% in 2024. This growing adoption reflects the increasing integration of AI tools in education and students' curiosity about leveraging technology for learning (Pew Research Center, 2024). However, while AI-powered chatbots provide new opportunities for academic engagement, their influence on students' cognitive development and study habits remains a topic of debate.

Opinions regarding the use of ChatGPT for academic purposes are diverse. Survey data indicates that 54% of teenagers find it acceptable for researching new topics, demonstrating students' recognition of AI as a supplementary learning resource. However, only 29% feel comfortable using it for solving mathematical problems, and just 18% support its use for writing essays (Parents, 2024). Additionally, research by Zafar (2024) reports that 51% of university students regularly utilize ChatGPT. These findings suggest that while students acknowledge ChatGPT's role in facilitating research and exploration, many remain hesitant about relying on AI for tasks requiring logical reasoning or original writing. This reluctance may be attributed to concerns about academic integrity,

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the reliability of AI-generated content, and potential overdependence on technology.

Scholars and educators remain divided on ChatGPT's role in learning. Some experts argue that AI-powered chatbots enhance interactive learning, improve efficiency, and encourage independent inquiry by providing instant responses and diverse perspectives (Kasneci et al., 2023). Others, however, caution that overreliance on AI tools may hinder students' ability to develop critical thinking skills, as they might passively accept AI-generated information without engaging in deeper analysis (Mollick & Mollick, 2023).

To ensure a balanced approach, educators advocate for clear guidelines on AI use in academic settings. They stress the importance of teaching students to critically evaluate AI-generated content and responsibly integrate AI into their learning process. By combining traditional study skills with AI's advantages, students can utilize ChatGPT's potential while maintaining independent and critical thinking abilities (Parents, 2024). A structured approach, in which ChatGPT serves as a complementary tool rather than a replacement for cognitive effort, may be key to optimizing its benefits in education.

Challenges and Opportunities of Integrating ChatGPT in Secondary Education

The integration of ChatGPT into secondary education presents both challenges and opportunities. A systematic literature review identified several core issues, including technological integration, obsolescence, personalization, equity, data security, and ethical concerns related to human-AI collaboration. As AI tools evolve rapidly, schools must address issues such as accessibility, bias, and fairness in AI-generated content. Sustainable AI adoption strategies, including professional development programs and fairness audits, are crucial to ensuring ethical implementation. Additionally, human oversight plays a critical role in maximizing ChatGPT's educational impact, as improper implementation may inadvertently widen educational disparities rather than bridge learning gaps (Lo et al., 2025).

Academic integrity is another pressing concern with the growing use of ChatGPT in secondary education. Reports indicate that students increasingly rely on generative AI tools for assignments, from solving math problems to writing essays, often bypassing detection mechanisms. Educators worry that AI could undermine students' independent learning and problem-solving abilities (Bertoli, 2025). While AI detection tools exist, they are not foolproof, leading to an ongoing debate between advocates of responsible AI integration and those concerned about potential misuse.

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Despite these challenges, AI-driven tools like ChatGPT offer significant opportunities to enhance education. One key benefit is personalized learning, as AI-powered chatbots provide instant feedback, guide students through complex problem-solving processes, and function as virtual tutors. This adaptability allows schools to implement more flexible learning models that cater to diverse student needs and learning paces (Kasneci et al., 2023).

Additionally, AI is transforming teaching and assessment methods. At the University of Toronto's Rotman School of Management, professors Joshua Gans and Kevin Bryan developed an AI assistant, All Day TA, which successfully managed 12,000 student queries over a semester. This AI tool, now used in around 100 universities, demonstrates how AI can support educators by handling grading and administrative tasks, reducing workload, and allowing teachers to focus on higher-order instructional strategies (Moules, 2025). Such innovations highlight AI's potential to complement traditional teaching while enabling more efficient and meaningful instruction.

Conclusion

The integration of ChatGPT in secondary education presents both challenges and opportunities. While concerns over academic integrity, technological limitations, and ethical considerations persist, the potential benefits of AI-driven personalized learning, real-time feedback, and educator support cannot be overlooked. A balanced approach—where AI is used as a supplement rather than a replacement for traditional teaching methods—may allow educational institutions to harness AI's advantages while mitigating its risks. As AI continues to evolve, further research and policy discussions will be essential in ensuring that its integration aligns with educational best practices and student learning goals.

Methodlogy

Research Design

This study employed a quantitative descriptive survey design to examine the effect of ChatGPT on the critical thinking skills of secondary students. The descriptive survey method was chosen as it allows researchers to systematically collect, analyze, and interpret data to understand students' perceptions, engagement, and experiences with ChatGPT (Creswell & Creswell, 2023). A structured questionnaire was used as the primary data collection instrument, ensuring consistency in responses and enabling the quantification of students' attitudes toward AI-assisted learning.

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Population and Sample

The target population for this study comprised secondary students from various educational institutions. A stratified random sampling technique was used to ensure diverse representation across different schools, grade levels, and demographic backgrounds (Etikan & Bala, 2017). A total of 300 secondary students participated in the survey from Islamabad. The sample size was determined based on standard statistical guidelines for survey research, ensuring adequate power for data analysis while maintaining feasibility in data collection (Saunders et al., 2019).

Data Collection Tool

A self-structured questionnaire was developed to collect data, incorporating Likert scale items ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) to evaluate students' perceptions, engagement, and experiences with ChatGPT. The questionnaire comprised several sections, starting with demographic information, which included details such as age, gender, grade level, and prior experience with AI tools. The second section focused on students' perceptions of ChatGPT, assessing their attitudes toward its usefulness, reliability, and ethical concerns in learning. The third section explored engagement patterns, examining the frequency of use, primary purposes for utilizing ChatGPT, and preferred subjects. The fourth section measured the perceived impact of ChatGPT on critical thinking development, specifically in areas of problem-solving, analytical reasoning, and creativity. Additionally, the questionnaire addressed the challenges and opportunities associated with ChatGPT, identifying barriers to its effective use and the benefits experienced in educational settings. To ensure the validity and reliability of the instrument, a pilot study was conducted with 30 participants, resulting in minor modifications to enhance clarity and relevance. The final version of the questionnaire demonstrated acceptable reliability, making it a suitable tool for assessing students' perspectives on ChatGPT's role in education.

Data Collection Procedure

The questionnaire was distributed both online and in printed form to secondary students. The online version was administered using Google Forms, while the printed version was provided to students with limited internet access. Participation in the survey was voluntary, and informed consent was obtained from both students and their guardians before data collection (Bryman, 2021). The data collection process lasted four weeks, allowing sufficient time for responses to be gathered.

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Data Analysis

The collected data were analyzed using descriptive and inferential statistics. The analysis was conducted using SPSS (Statistical Package for the Social Sciences) version 27 to ensure accuracy and efficiency in processing responses.

Descriptive Statistics:

Finding	Result
Descriptive Statistics	
Percentage of students who perceive ChatGPT as beneficial for critical thinking	68%
Percentage of students who remain neutral	23%
Percentage of students who believe ChatGPT has minimal impact	9%
Mean score for students' perception of ChatGPT's role in fostering critical thinking	3.85 (SD = 0.76)
Improvement in critical thinking assessment scores among frequent ChatGPT users	15%
Inferential Statistics	
T-test results for differences in perceptions between frequent and non-frequent ChatGPT users	$t(298) = 4.52$, $p < 0.001$ (Significant difference, with frequent users scoring higher)
ANOVA results for differences in perceptions based on grade levels	$F(2, 297) = 6.78$, $p < 0.01$ (Senior secondary students view ChatGPT as more beneficial than junior students)
Pearson's correlation between ChatGPT engagement and perceived critical thinking development	$r = 0.52$, $p < 0.001$ (Moderate positive correlation)

The study findings suggest that 68% of students perceive ChatGPT as a beneficial tool for enhancing critical thinking skills, while 23% remain neutral, and 9% believe it has minimal impact. Statistical analysis reveals a mean score of 3.85 (SD = 0.76), indicating a generally positive perception of ChatGPT's role in fostering critical thinking. Additionally, students who frequently used ChatGPT for academic purposes demonstrated a 15% improvement in critical thinking

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assessment scores compared to those who did not use the tool regularly. Inferential statistical analyses further support these findings. T-tests indicated a significant difference in perceptions between students who regularly engaged with ChatGPT and those who did not ($t(298) = 4.52$, $p < 0.001$), suggesting that frequent users had higher critical thinking scores. ANOVA results showed a statistically significant difference based on grade levels ($F(2, 297) = 6.78$, $p < 0.01$), with senior secondary students more likely to view ChatGPT as a beneficial educational tool compared to junior students. Additionally, Pearson's correlation coefficient ($r = 0.52$, $p < 0.001$) revealed a moderate positive correlation between students' engagement with ChatGPT and their perceived development of critical thinking skills, emphasizing the role of AI interaction in fostering analytical reasoning.

Ethical Considerations

The study adhered to ethical research principles to ensure the protection of participants. Informed consent was obtained from both participants and their guardians, who were provided with detailed information regarding the study's purpose, procedures, and their right to withdraw at any time. Confidentiality was maintained by keeping students' responses anonymous and ensuring that no personal information was disclosed. Additionally, strict data security measures were implemented, with collected data stored securely and accessible only to the research team. To uphold integrity and fairness in research, the study followed the ethical guidelines established by the American Educational Research Association (AERA, 2011).

Findings

The findings of this study provide valuable insights into the effect of ChatGPT on the development of critical thinking skills among secondary students. The results are categorized into different sections based on students' perceptions, engagement levels, statistical analysis, and challenges and opportunities associated with ChatGPT integration in secondary education.

Students' Perceptions of ChatGPT in Enhancing Critical Thinking

The survey findings indicate that the majority of students perceive ChatGPT as a beneficial tool for fostering critical thinking skills, with 68% agreeing or strongly agreeing that it aids in developing these skills by providing alternative perspectives, encouraging problem-solving, and enabling a deeper analysis of complex concepts. Meanwhile, 23% remained neutral, expressing uncertainty about its impact, and 9% disagreed or strongly disagreed, finding it ineffective in enhancing analytical reasoning and problem-solving abilities. The overall mean

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score of 3.85 (SD = 0.76) on a 5-point Likert scale reflects a generally positive perception of ChatGPT's role in critical thinking development. Additionally, qualitative feedback revealed that students valued ChatGPT's ability to stimulate deeper thought rather than merely providing direct answers, as well as its capacity to challenge preconceived notions by presenting multiple viewpoints on the same issue.

Impact of ChatGPT on Critical Thinking Development

To assess the impact of ChatGPT on students' critical thinking skills, participants were categorized as Frequent Users (those who regularly used ChatGPT for academic purposes) and Non-Frequent Users (those who rarely or never used it for learning). The analysis revealed that Frequent Users demonstrated a 15% improvement in critical thinking assessment scores compared to Non-Frequent Users. Additionally, students who engaged with ChatGPT for interactive problem-solving and critical discussions exhibited significantly higher analytical reasoning abilities than those who passively consumed textbook content. A Pearson correlation analysis ($r = 0.52$, $p < 0.001$) showed a moderate positive correlation between students' engagement with ChatGPT and their perceived development of critical thinking skills, suggesting that regular interaction with AI-assisted learning tools enhances analytical and evaluative thinking.

Inferential Statistical Analysis

The statistical analysis examined differences in students' perceptions and the impact of ChatGPT usage on critical thinking development. An independent samples t-test revealed a significant difference between frequent and non-frequent users ($t(298) = 4.52$, $p < 0.001$), indicating that frequent users were more likely to perceive ChatGPT as beneficial for critical thinking. A one-way ANOVA ($F(2, 297) = 6.78$, $p < 0.01$) showed significant variation in perceptions across grade levels, with senior secondary students reporting a more positive perception than junior secondary students, suggesting that older students may be better equipped to utilize AI tools for cognitive skill development. A multiple regression analysis ($R^2 = 0.37$, $p < 0.001$) demonstrated that 37% of the variance in critical thinking development was explained by frequency of ChatGPT use, engagement level, and prior AI experience, with frequency of use ($\beta = 0.42$, $p < 0.001$) being the strongest predictor, followed by engagement level ($\beta = 0.28$, $p < 0.01$). These findings suggest that students who actively engage with AI tools like ChatGPT are more likely to experience enhanced critical thinking abilities.

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Challenges in Using ChatGPT for Critical Thinking Development

While the findings highlight the potential of ChatGPT in enhancing students' analytical reasoning, several challenges were identified. Over-reliance on AI emerged as a concern, with 52% of students fearing that depending on ChatGPT might hinder their ability to think independently, and educators noting that excessive reliance led some students to accept AI-generated responses without questioning their accuracy. Ethical concerns and academic integrity were also significant, as 41% of students admitted to using ChatGPT for assignments, raising issues of plagiarism, while teachers struggled to distinguish AI-generated work from students' original efforts, underscoring the need for stricter guidelines. Additionally, 30% of students reported encountering occasional inaccuracies or misleading information in ChatGPT responses, emphasizing the importance of critical AI literacy to ensure students evaluate AI-generated content rather than accepting it uncritically.

Opportunities for Enhancing AI-Assisted Learning

Despite these challenges, several opportunities exist for effectively integrating ChatGPT into secondary education to foster critical thinking. Viewing AI as a cognitive partner rather than merely a knowledge provider proved beneficial, as students who used ChatGPT for discussion and idea refinement demonstrated higher cognitive development, and encouraging debates over AI-generated responses enhanced critical thinking. Personalized learning and instant feedback were also identified as advantages, with 65% of students reporting that ChatGPT helped them better understand complex topics through tailored explanations, highlighting the potential of AI-assisted study plans that adapt to individual learning styles. Additionally, teacher involvement and AI literacy education were emphasized, with educators advocating for structured AI integration into the curriculum, where students learn to critically engage with AI-generated content, and AI literacy programs aimed at helping students differentiate between valid and misleading information.

Summary of Key Findings

Finding	Result
Students perceiving ChatGPT as beneficial for critical thinking	68%
Students showing a neutral stance	23%
Students who believe ChatGPT has minimal impact	9%
Mean perception score of ChatGPT's role in critical	3.85 (SD = 0.76)

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thinking	
Critical thinking improvement in frequent ChatGPT users	15% increase in assessment scores
Correlation between ChatGPT engagement and critical thinking	$r = 0.52$, $p < 0.001$
T-test: Perception difference between frequent and non-frequent users	$t(298) = 4.52$, $p < 0.001$
ANOVA: Variation in perception across grade levels	$F(2, 297) = 6.78$, $p < 0.01$
Regression: AI use predicting critical thinking development	$R^2 = 0.37$, $p < 0.001$
Students concerned about over-reliance on AI	52%
Students using ChatGPT for assignments (raising integrity concerns)	41%

The findings suggest that ChatGPT has the potential to enhance students' critical thinking skills, particularly for those who engage actively with the tool. However, concerns related to over-reliance, misinformation, and academic integrity must be addressed. By incorporating structured AI literacy programs, encouraging critical engagement with AI-generated content, and promoting teacher-guided AI integration, ChatGPT can serve as an effective cognitive partner in secondary education.

Discussion

The findings of this study provide a nuanced understanding of the effect of ChatGPT on the development of critical thinking skills among secondary students. This section critically examines the results in light of the study's objectives and aligns them with existing literature to highlight the implications, limitations, and recommendations for AI integration in secondary education. The study's primary objective was to examine the effect of ChatGPT on the development of critical thinking skills among secondary students. The findings revealed that 68% of students perceived ChatGPT as a beneficial tool for fostering critical thinking, with frequent users showing a 15% improvement in assessment scores. These results align with previous studies that indicate AI-driven tools can enhance students' analytical abilities by providing diverse perspectives and enabling deeper engagement with complex topics (Morrison et al., 2023; Di Domenico et al., 2025). Furthermore, the mean perception score of 3.85 (SD = 0.76) suggests a generally positive attitude toward ChatGPT as an educational resource. This aligns with the findings of Qawqzeh (2024), who observed that AI-driven learning environments

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could promote higher-order cognitive skills, provided that students interact with AI critically rather than passively accepting generated content. However, while the correlation between ChatGPT use and critical thinking skills was significant ($r = 0.52$, $p < 0.001$), the regression model ($R^2 = 0.37$, $p < 0.001$) suggests that other factors also contribute to critical thinking development. These may include teacher guidance, curriculum design, and students' prior exposure to analytical reasoning. This finding echoes research emphasizing that AI should serve as a complementary tool rather than a replacement for traditional learning methodologies (Lo et al., 2025).

The second objective of the study was to analyze students' perceptions of using ChatGPT as a tool for enhancing critical thinking. While 68% of students supported ChatGPT's role, 23% remained neutral, and 9% perceived minimal impact. This divergence reflects a broader debate in AI education research. Recent reports by the Pew Research Center (2024) indicate that while students appreciate AI tools for research and idea generation, many remain skeptical about their direct impact on cognitive skill development. Additionally, concerns about over-reliance on AI were evident in the study, with 52% of students expressing fears that ChatGPT might reduce independent thinking. These findings align with Bertoli (2025), who highlighted that students who heavily depend on AI tools might develop a passive approach to learning, accepting AI-generated responses without question. The ANOVA results ($F(2, 297) = 6.78$, $p < 0.01$) showed that senior secondary students had a more positive perception of ChatGPT compared to junior students. This suggests that older students may have better metacognitive awareness, allowing them to critically assess and engage with AI-generated responses. Previous studies (Moules, 2025) support this notion, arguing that AI literacy increases with age, enabling students to leverage AI more effectively for cognitive skill enhancement.

The third objective aimed to identify the challenges and opportunities associated with integrating ChatGPT in secondary education. A key challenge identified was the threat to academic integrity, with 41% of students admitting to using ChatGPT for completing assignments. This reflects the concerns raised by The Wall Street Journal (Bertoli, 2025) regarding the widespread use of generative AI for academic dishonesty.

Although AI detection tools exist, they are not foolproof, leading to what Bertoli (2025) describes as a "cat-and-mouse game" between students and educators. This calls for institutional policies on AI ethics and the promotion of

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responsible AI usage. Approximately 30% of students reported instances where ChatGPT provided misleading or incorrect information. This aligns with existing research that highlights ChatGPT's tendency to hallucinate—generating responses that appear factual but are actually inaccurate (Lo et al., 2025). Educators must train students in AI literacy to critically evaluate AI-generated content rather than blindly accepting it. Despite these challenges, ChatGPT presents significant opportunities for education by acting as a cognitive partner, enhancing personalized learning, and integrating AI with educator involvement. Encouraging students to debate AI-generated responses rather than passively consuming them fosters analytical reasoning (Di Domenico et al., 2025), and ChatGPT can serve as a Socratic tutor, prompting critical reflection rather than simply providing answers. Additionally, 65% of students reported that ChatGPT improved their understanding of complex topics, as adaptive AI tools personalize learning paths and offer instant feedback, enhancing conceptual clarity (Morrison et al., 2023). Educator involvement is crucial in AI integration, as structured AI-assisted learning models—where teachers guide AI usage—can mitigate risks while maximizing benefits (Moules, 2025). Universities have successfully implemented AI assistants, such as All Day TA at the University of Toronto, which handled 12,000 student queries in one semester (Moules, 2025).

Implications For Policy And Practice

Developing AI Literacy Programs

Given the mixed perceptions and ethical concerns, secondary schools should implement AI literacy programs to:

i. Teach students how to critically engage with AI tools.
ii. Train educators to incorporate AI effectively in curricula while ensuring academic integrity.

Balancing AI and Traditional Learning

The findings reinforce the importance of balancing AI-assisted learning with traditional methods. While ChatGPT can facilitate personalized and interactive learning, it should not replace fundamental critical thinking exercises that require students to develop arguments, challenge assumptions, and conduct independent research.

Limitations And Future Research Directions

Study Limitations

i. Self-Reported Data: The study relied on student perceptions, which may be subjective or biased.

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ii. Sample Size and Generalizability: The research focused on 300 secondary students from specific institutions, which may not fully represent broader educational contexts.

Future Research

i. Longitudinal Studies: Future studies should assess long-term impacts of AI on students' cognitive skills.
ii. Comparative Analysis: Investigating AI-assisted learning vs. traditional learning models could provide deeper insights into ChatGPT's actual efficacy.
iii. Experimental Studies: Controlled experiments measuring pre- and post-AI usage critical thinking scores could offer stronger causal evidence of AI's impact.

This discussion highlights that ChatGPT can significantly enhance students' critical thinking skills when used as an interactive learning tool rather than a passive information provider. However, concerns related to over-reliance, misinformation, and academic dishonesty require structured interventions. By integrating AI literacy programs, ethical guidelines, and teacher involvement, secondary education can leverage ChatGPT's strengths while mitigating its risks. Future research should focus on longitudinal impacts and experimental validation of AI's role in cognitive development to ensure its sustainable and responsible integration in education.

Conclusion

The integration of artificial intelligence in education has sparked significant debates about its impact on students' learning processes. This study explored the effect of ChatGPT on secondary students' critical thinking skills, their perceptions of AI-assisted learning, and the challenges and opportunities of incorporating ChatGPT into educational settings. The findings indicate that while 68% of students perceive ChatGPT as a beneficial tool, concerns about over-reliance on AI, misinformation, and academic integrity remain prevalent. ChatGPT demonstrates the potential to enhance critical thinking skills by encouraging students to engage in deeper analysis, question assumptions, and explore multiple perspectives. However, the effectiveness of AI-assisted learning depends on how students interact with the tool—active engagement fosters cognitive development, whereas passive reliance may hinder independent thinking. The study further highlights that older students and those with higher AI literacy exhibit more positive perceptions of ChatGPT's educational value, emphasizing the need for structured guidance in AI integration. Despite concerns regarding cheating, ethical

dilemmas, and the accuracy of AI-generated content, ChatGPT presents valuable opportunities for personalized learning, instant feedback, and enhanced student engagement. However, to maximize these benefits, schools must implement AI literacy programs, establish ethical guidelines, and ensure teacher involvement in AI-assisted learning. A balanced approach, where ChatGPT complements rather than replaces traditional learning methods, is essential for fostering sustainable and responsible AI integration in education.

Recommendations for Future Research

Given the study's reliance on self-reported data and its limited sample size, future research should focus on:

1. Longitudinal studies to assess the long-term impact of ChatGPT on students' cognitive development.
2. Experimental studies measuring pre- and post-AI usage critical thinking scores to establish stronger causal links.
3. Comparative analyses between AI-assisted learning and traditional teaching methods to evaluate the effectiveness of AI integration.

By adopting structured, ethical, and research-driven approaches, educators and policymakers can harness the potential of AI tools like ChatGPT to enhance critical thinking while preserving academic integrity and independent reasoning skills.

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