

Influence of Artificial Intelligence (AI) Tools on the Research Capabilities of College Students

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Introduction:

Artificial Intelligence (AI) tools, such as ChatGPT and Grammarly, have become increasingly integrated into academic and research settings. These tools offer college students support in areas like content generation, grammar checking, idea development, and information synthesis, enhancing their research workflows. As students rely more on AI technologies, there is a growing need to evaluate the influence of these tools on their research capabilities, specifically focusing on the quality of research papers and the innovation of ideas. This article aims to examine whether the use of AI tools enhances or inhibits students' ability to think critically, generate new ideas, and present well-structured academic work. Ultimately, we seek to understand the balance between leveraging technology and fostering essential cognitive skills.

Objectives:

- To analyse the impact of AI tools like ChatGPT and Grammarly on the quality of research papers produced by college students.
- To assess whether AI tools contribute to innovation in research ideas.
- To explore how the use of AI tools influences the research methodology and writing processes of students.
- To evaluate the extent to which AI tools can support the critical thinking and problem-solving abilities of students during research.

Need for the Study:

- With the increasing adoption of AI tools in education, there is a need to assess their role in shaping students' research capabilities.
- College students are frequently exposed to vast amounts of information and must synthesize this into coherent, innovative research.

- AI tools promise to assist in this by offering quick access to information, feedback on grammar and syntax, and even idea development. However, questions remain as to whether these tools genuinely enhance the learning and research process or whether they may inadvertently limit the development of essential skills, such as critical thinking and independent analysis.
- Understanding this impact is critical for educators and institutions to guide students in using AI effectively and ensure that technology supplements, rather than replaces, human cognitive effort.

Scope of the Study:

- Analysing AI's role in aiding students at various stages of research, from topic selection to drafting and revision.
- Investigating how AI tools impact the originality and depth of academic research.
- Surveying students and educators to gather perspectives on AI tools and their influence on research skills.
- Comparing research papers produced with and without the aid of AI tools to quantify any differences in quality, structure, or innovation.
- Exploring the long-term implications of AI use on student learning and intellectual growth in the academic context.

Review of Literature:

Balfour, S. P. (2020): In "The Role of Artificial Intelligence in Higher Education: Challenges and Opportunities," Balfour discusses how AI tools can facilitate personalized learning, adapting content to meet individual student needs, which enhances engagement and efficiency in research processes.

Carbone, R., & Armellini, A. (2021): Their study, "Critical Thinking and AI: Opportunities and Challenges for Higher Education," highlights that tools like Grammarly improve writing quality and educate students on grammar, ultimately fostering greater confidence in academic writing.

Janssen, S., & Makris, E. (2019): In "AI and the Future of Research: Opportunities for Innovation and Risks of Homogenization," the authors suggest that reliance on AI may diminish critical thinking skills, as students could become passive consumers of AI-generated content.

Premsky, M. (2022): In "Harnessing AI for Educational Purposes: The Benefits and Drawbacks of Using AI Tools in Academic Research," Premsky argues that AI can enhance critical thinking by offering diverse viewpoints, prompting deeper engagement with research material.

Wilson, B., & Anderson, C. (2021): Their article "Ethical Challenges in the Use of AI in Academic Research" emphasizes that AI tools can inspire creativity by exposing students to a wider range of ideas, but they also caution against the risk of homogenization of thought, which can limit originality.

Hypothesis:

Null Hypothesis (H_0): The use of AI tools like ChatGPT and Grammarly does not significantly influence the research capabilities of college students.

Alternative Hypothesis (H_1): The use of AI tools like ChatGPT and Grammarly positively influences the research capabilities of college students, enhancing the quality of research papers and promoting innovation in ideas.

DATA ANALYSIS

1. Cross tabulation:

1. Have AI tools helped you develop new research Skills?

| Age Range | Accepted | Don't Accepted | Total |
|-----------|----------|----------------|-------|
| Below 18 | 4 | 0 | 4 |
| 18-21 | 28 | 10 | 38 |
| 22-25 | 39 | 8 | 47 |
| Above 30 | 4 | 1 | 5 |
| Total | 75 | 19 | 94 |

Interpretation:

Out of 94 respondents, 75 (79.8%) accepted that AI tools helped them develop new research skills, while 19 (20.2%) did not. The majority of the respondents found AI tools useful for research.

2. Descriptive statistics:

| Questions | Category | Frequency | Percentage |
|--|----------------------------------|-----------|------------|
| What is your age range? | 22-25 | 47 | 50.00% |
| | 18-21 | 38 | 40.43% |
| | Above 30 | 5 | 5.32% |
| | Below 18 | 4 | 4.26% |
| Which AI tools do you commonly use for research? | ChatGPT | 57 | 60.64% |
| | ChatGPT;Grammarly | 13 | 13.83% |
| | ChatGPT;Google Scholar | 8 | 8.51% |
| | ChatGPT;Grammarly;Google Scholar | 3 | 3.19% |
| | Google Scholar | 3 | 3.19% |
| | Meta | 2 | 2.13% |
| | Gemini | 2 | 2.13% |

| | | | |
|--|-----------------------------------|----|--------|
| | ChatGPT;Grammarly;Google Scholar; | 1 | 1.06% |
| | Grammarly;Google Scholar | 1 | 1.06% |
| | Grammarly | 1 | 1.06% |
| | None | 1 | 1.06% |
| | ChatGPT;Meta | 2 | 2.13% |
| Do you believe AI tools can replace human researchers? | Yes | 47 | 50.00% |
| | No | 34 | 36.17% |
| | Undecided | 13 | 13.83% |

Interpretation:

The survey shows that 90.43% of respondents are aged 18-25, indicating a youthful demographic. ChatGPT is the primary AI tool used, with 50% believing AI could replace human researchers, while 36.17% disagree. This highlights a strong openness to AI integration in research alongside some skepticism about its capabilities.

3.Chi-square test:

How do AI tools impact the efficiency of your research process?

| | | Significantly Improve | Improve | No Impact | Hinder | Significantly Hinder | Total |
|---|------------------------|-----------------------|---------|-----------|--------|----------------------|-------|
| How comfortable are you with the idea of using AI tools for research? | Very uncomfortable | 5.11 | 7.66 | 2.38 | 0.68 | 0.17 | 16 |
| | Neutral | 7.98 | 11.97 | 3.72 | 1.06 | 0.27 | 25 |
| | Very comfortable | 6.06 | 9.1 | 2.83 | 0.81 | 0.2 | 19 |
| | Somewhat comfortable | 7.98 | 11.97 | 3.72 | 1.06 | 0.27 | 25 |
| | Somewhat uncomfortable | 2.87 | 4.31 | 1.34 | 0.38 | 0.1 | 9 |
| Total | | 30 | 45.01 | 13.99 | 3.99 | 1.01 | 94 |

Chi² df p

How comfortable are you with the idea of using AI tools for research? - How do AI tools impact the efficiency of your research process? 18.27 16 .308

Interpretation:

The Chi-square test results indicate a significant association between how comfortable AI tools using and how AI tools impact the efficiency ($p\text{-value} = 0.308$). This suggests that AI tools comfortable for the research.

Findings:

1. Familiarity with AI tools:

Approximately 35.1% of respondents are very familiar with AI tools, while 34.0% are neutral, 17.0% are somewhat familiar, 7.4% are not familiar at all, and 6.4% consider themselves experts.

2. Quality of research papers before using AI tools:

Before using AI tools, 38.3% rated the quality of their research papers as good, 34.0% as excellent, 20.2% as fair, 6.4% as outstanding, and 1.1% as poor.

3. Quality of research papers after using AI tools:

Following the use of AI tools, 44.7% rated the quality of their research papers as excellent, 35.1% as good, 9.6% as fair, 8.5% as outstanding, and 2.1% as poor.

4. Impact of AI tools on generating innovative ideas:

Around 72.3% believe AI tools have helped them generate innovative ideas, while 19.1% do not, and 8.5% are undecided.

5. Comfort with using AI tools for research:

Comfort levels with using AI tools for research vary, with 26.6% feeling neutral, 26.6% somewhat comfortable, 20.2% very comfortable, 17.0% very uncomfortable, and 9.6% somewhat uncomfortable.

6. Replacement of human researchers by AI tools:

Half of the respondents (50.0%) believe AI tools can replace human researchers, 36.2% disagree, and 13.8% are undecided.

7. Efficiency of the research process with AI tools:

AI tools are reported to improve research efficiency for 47.9% of respondents, significantly improve it for 31.9%, have no impact for 14.9%, hinder it for 4.3%, and significantly hinder it for 1.1%.

8. Development of new research skills:

A significant 79.8% of respondents feel AI tools have helped them develop new research skills, while 20.2% do not.

9. Areas of research improvement due to AI tools:

AI tools have improved research capabilities mainly in data analysis (54.3%), followed by writing (28.7%), and literature review (17.0%).

10. Concerns about ethical implications:

Approximately 77.7% of respondents are concerned about the ethical implications of using AI tools in research, while 22.3% are not.

11. Concerns about plagiarism or academic dishonesty:

About 37.2% are neutral on whether AI tools could lead to plagiarism or academic dishonesty, 26.6% agree, 26.6% strongly agree, 7.4% disagree, and 2.1% strongly disagree.

12. Impact of AI tools on future research:

The majority (74.5%) expect AI tools to positively impact their future academic or professional research, 17.0% foresee a negative impact, and 8.5% are unsure.

Conclusion:

This study highlights the dual role of AI tools like ChatGPT and Grammarly in shaping the research capabilities of college students. On one hand, these tools can significantly enhance the quality of research papers by improving writing clarity and providing quick access to information. As Balfour (2020) notes, AI can facilitate personalized learning, which can lead to greater engagement and efficiency in research processes.

On the other hand, there are concerns regarding the potential inhibition of critical thinking and innovation. As Janssen and Makris (2019) warn, reliance on AI might lead students to become passive consumers of content, diminishing their analytical skills. While Prensky (2022) argues that AI can encourage deeper engagement with diverse perspectives, the risk of homogenization in thought, as discussed by Wilson and Anderson (2021), cannot be overlooked.

Ultimately, the findings suggest that while AI tools can support academic writing and research processes, their impact on critical thinking and innovation remains complex. Educators must be mindful of how these tools are integrated into academic settings to ensure that they supplement, rather than supplant, essential cognitive skills. Moving forward, it is crucial to strike a balance between leveraging AI for efficiency and fostering independent thought and creativity in students.

This nuanced understanding will be essential for guiding the effective use of AI in education, ensuring that students benefit from technological advancements without compromising their intellectual growth.

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