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Harnessing Artificial Intelligence for Enhanced Scientific Collaboration: Insights from Students and Educational Implications

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Abstract: This study aimed to explore students' perspectives on integrating artificial intelligence (AI) into scientific collaboration, specifically on writing academic articles and creating scientific posters. The research employed open-ended interviews conducted among 61 civil and military students. Opinions were labelled, coded, and gathered into the following categories: positive impact on collaboration, challenges faced, and educational impact. Among the positives were improving efficiency, enhancing the quality of work, and generating new ideas. The challenges concerned experiencing technical difficulties with AI tools, inconsistency in AI outputs, and AI dependence, which may lead to behaviours on the verge of addiction. Regarding educational impact, students noticed that AI helps improve learning new skills, increases engagement in the task, and enhances critical thinking. As one researcher performed the thematic analyses, Cohen's Kappa statistic was used to ensure intra-coder reliability. This study highlights the need for further research to optimize the use of AI in scientific collaboration while addressing ethical concerns related to students' motivations for using AI tools, promoting responsible use, and researching students' emotions, cognitive processes, and behaviours resulting from their interactions with AI tools. The research provides valuable insights for educators and policymakers to integrate AI effectively into academic practice.

Keywords: artificial intelligence; teamwork communication; scientific collaboration

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Citation: Gawlik-Kobylińska, M. Harnessing Artificial Intelligence for Enhanced Scientific Collaboration: Insights from Students and Educational Implications. *Educ. Sci.* **2024**, *14*, 1132. https://doi.org/10.3390/educsci14101132

Academic Editors: Sharifu Ura and Mike Joy

Received: 18 August 2024
Revised: 1 October 2024
Accepted: 16 October 2024
Published: 18 October 2024

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1. Introduction

In an era where technological advancements rapidly reshape various aspects of professional and academic life, integrating artificial intelligence (AI) into scientific collaboration represents a significant frontier. AI in academic practice is perceived as a transformative force, promising to enhance scientific research productivity, innovation, and accuracy. The influx of tools has become designed to support a variety of scientific activities, among others, writing publications and creating dissemination materials, such as posters or videos. Support is given through generating text, analysing data, and creating visual representations of complex information (e.g., [1–3]). However, the application of AI in academic contexts is not without controversy. Divergent hypotheses regarding the effectiveness of AI, its impact on academic integrity [4,5] and ethics [6–9], and the potential for over-reliance on technology have fuelled the ongoing debate [10,11].

In the literature across various disciplines, specific attention is given to the ethical implications of AI use, particularly regarding intellectual property [12–14], algorithmic biases [15], and motivations [16]. AI-generated content raises questions about authorship, copyright, and ownership, as these tools can create or modify text, images, and other media. Biases in AI algorithms, often due to the data used for training, can lead to unfair treatment, reinforce stereotypes, or overlook marginalized groups. As new AI tools emerge, examining the motivations behind their use is becoming increasingly important.

Additionally, researchers emphasize the importance of promoting the responsible use of AI tools. This involves applying the tools transparently and equitably, establishing clear

guidelines, ensuring fair access for all collaborators [17,18], and regularly monitoring for biases to address any issues that could lead to unfair outcomes [19].

As AI tools become accessible and their use democratized, human–machine (AI) interactions increase. Students, as AI users, may experience various emotions, states, and behaviours due to the human–machine collaboration [20,21]. Therefore, it is essential to understand how students' emotions, cognitive processes, and behaviours resulting from using AI tools affect their learning experiences and collaborative efforts in scientific work.

This study addresses all these issues by examining student perspectives on using AI in scientific collaboration, namely, writing articles and creating scientific posters. By collecting feedback from 61 students, this research aims to reveal the practical benefits, challenges, and educational impacts of AI in academic work. For this reason, a qualitative methodology is chosen to provide a deeper understanding of individual behaviours and attitudes, capturing nuances that quantitative methods might overlook. While considerable attention has been paid to AI's role in higher education, its effects on these specific aspects of academic work are still relatively underexplored. Understanding how AI tools influence these areas could provide valuable insights into improving educational practices and collaboration strategies.

Given the increasing number of studies on AI in higher education and academic collaboration, this article begins with a literature review to contextualize AI's role in scientific collaboration. It also examines students' perspectives as investigated by other scholars. This article then covers the methodology, results, discussion, further implications, and conclusions.

2. Literature Review

2.1. The Role of AI in Scientific Collaboration and Education

The growing emphasis on artificial intelligence (AI) applications in scientific collaboration is reflected in current academic discourse. This review explores AI's expanding role in this field, using Boolean searches in databases and insights from Elicit software (available online: https://elicit.com/ accessed on 15 August 2024) to highlight emerging trends and their impact. A Boolean search query in the Web of Science Core Collection with the terms "AI" (Topic) AND "writing articles" (Topic) OR "creating scientific posters" (Topic) and time constraints (2021–2024) indicated the following rising trend in publications: 39 publications in 2021, 83 in 2022, 154 in 2023, and 136 in 2024, with a total of 2448 citations for 2024 alone. Similarly, a search in the Scopus database, with the query TITLE-ABS-KEY (AI) AND TITLE-ABS-KEY (writing AND articles) OR TITLE-ABS-KEY (creating AND scientific AND posters) AND PUBYEAR > 2020 AND PUBYEAR < 2025, showed the following increase in publications: 25 in 2021, 49 in 2022, 194 in 2023, and 177 in 2024. Both searches were performed on 16 August 2024. The growing body of literature on using AI tools for scientific writing and creating visual materials, such as scientific posters, requires an analytical approach. For this reason, Elicit software was chosen for a complex literature review. This application allows for automatic specific data extraction, such as the advantages and disadvantages of using AI tools in academic work. A total of 192 publications was generated from Elicit (as of 16 August 2024), based on the query "AI for writing scientific articles and creating scientific posters" with the use of filters such as publication dates (2021–2024) and journal quality (Q1 and Q2). The obtained material in a CSV file (Supplementary Material) was analysed using Python and the Pandas (available online: https://pandas.pydata.org accessed on 15 August 2024) library to process and categorize data from the file systematically. Using Pandas, the occurrences of each category were counted by applying the "value_counts()" function to the "Category" column in the respective DataFrames. This function provided the frequency of each category within the dataset. The results were then compiled into new DataFrames that listed each category alongside its corresponding number of occurrences. Advantages were gathered into categories such as "Efficiency and productivity", "Research support", and "Language and quality improvement". At the same time, disadvantages were categorized into "Ethical

concerns", "Risk of fraud and plagiarism", and "Accuracy and validation". Entries that did not fit these categories were labelled as "Miscellaneous". The frequency of each descriptor was calculated, revealing that the "Miscellaneous" category was the most frequent for both advantages (99 occurrences) and disadvantages (115 occurrences), followed by "Language and quality improvement" for advantages (39 occurrences) and "Accuracy and validation" (33 occurrences) for disadvantages.

This process allowed for a structured and quantifiable overview of the advantages and disadvantages and the corresponding categories. Table 1 (concerning advantages) and Table 2 (concerning disadvantages) present the categories, number of occurrences, and their literature examples.

Table 1. Categories and examples of descriptors from the literature concerning the advantages of using AI in scientific collaboration.

Category	Examples of Descriptors from the Literature
Efficiency and productivity (27 occurrences)	Increased efficiency and productivity, allowing researchers to complete tasks like formatting and generating text much more quickly [22]. Helping to increase productivity by providing initial text to build upon (to generate lay abstracts) [23]. Improved research productivity and efficiency. Improved efficiency and productivity, more accurate and consistent content, idea generation, and improved collaboration [24]. Increased efficiency and productivity in scientific writing by allowing faster dissemination of knowledge and reducing workload [25].
Research support (27 occurrences)	AI can assist scientists with material organization, draft creation and proofreading [26]. AI tools like ChatGPT could transform the nature of scientific papers [27]. AI algorithms effectively summarize scientific publications into plain-language texts and press statements, and semantic tools may empower transparent and proficient data extraction tactics [28]. AI can improve the readability and clarity of publications, allows for content editing, and is used to develop concepts or ideas for a paper [29]. AI can generate messages perceived as more effective and stronger arguments and evoke more positive attitudes than human-authored messages [30].
Language and quality improvement (39 occurrences)	Improving a manuscript regarding the title, abstract, and conclusions to tailor to a given journal as long as the AI does not alter the intended meaning [22]. English language improvement for publication [31]. Help in language translation [24]. AI can assist in producing high-quality, well-researched articles that are free from bias and errors [24]. Improving writing quality and accessibility, especially for non-native speakers of English [32].
Miscellaneous (99 occurrences)	Can augment human innovation teams [33]. Critical thinking and analytical skills development [34]. Facilitation of creative ideation for scientific problems [35]. AI helps improve data quality, minimize repetitive tasks, and eliminate versioning issues [36]. Visual aids such as infographics for scientific purposes [37].

Table 2. Categories and examples of descriptors from the literature concerning the disadvantages of using AI in scientific collaboration.

Category	Examples of Descriptors from the Literature
Risk of fraud and plagiarism (nine occurrences)	The potential for AI-generated content to be used fraudulently raises concerns about the validity of published research [38]. Generative AI can produce errors, misleading information, and even fraudulent content, especially for technical topics [39]. Concern that AI could facilitate more scientific fraud beyond just plagiarism [40]. AI algorithms can produce false positives, leading to unnecessary investigations and potentially damaging the reputation of researchers [41]. The AI-assisted approach resulted in inaccurate reference attributions (about 20%) and a higher similarity index, suggesting an increased risk of plagiarism [42].

Table 2. *Cont.*

Category	Examples of Descriptors from the Literature
Ethical concerns (16 occurrences)	AI has become a co-author on scientific papers [43]. Privacy, ethics, bias, and the legal liability around AI tools [44]. AI tools can be used as "mental orthosis" for intellectual production to polish articles but with concern for ethics and careful maintenance of accuracy and reliability [45]. Ethical issues such as plagiarism and concerns about the accuracy of AI-generated writing [24]; concerns about the authenticity and credibility of the academic work; and a need to maintain human intelligence and critical thinking in the research process [46]. Automatically generating scholarly manuscripts raises ethical concerns in academic publishing [47].
Quality concerns (19 occurrences)	AI could rapidly generate large numbers of fake or low-quality scientific papers, making it harder to detect fraudulent research [48]. ChatGPT does not provide an explainability of the generation process, nor does it disclose the level of its uncertainty [49]. Lack of real-time context awareness can lead to misinterpretation or incorrect conclusions [50]. Predatory journals could exploit it to publish low-quality, misleading content, undermining trust in research publications [51]. It can be challenging to control the quality and tone of the AI-generated content [52].
Accuracy and validation (33 occurrences)	Requires more extensive fact-checking, as up to 70% of references cited were found to be inaccurate with the AI-only approach [53]. It requires human oversight to ensure the accuracy of the results [54]. There is a risk of misdiagnosis or incorrect information, as the responses are based on training data patterns rather than evidence-based [55]. Existing tools to detect AI-generated text have limited accuracy and need to evolve constantly; they can hallucinate (which is creating fake responses when they do not know the answer) [56]. The vulnerability of AI models to biases [48]; LLM AI tools are trained on the existing literature that may be inaccurate and biased [43].
Miscellaneous (115 occurrences)	The need for researchers, publishers, and reviewers to be vigilant and use tools to screen for AI-generated content [38]. The importance of not allowing AI to replace human creativity, critical thinking, and ethical reasoning completely in the scientific process [38]. Over-reliance on the AI system, loss of human agency, and issues of trust in the AI-generated content [57]. AI could enable more scientific fraud, including issues beyond plagiarism. Current plagiarism detection software struggles to identify the use of large language models like ChatGPT [40]. Human oversight and validation are needed, as the final manuscript should be a human endeavour [22]; dehumanization of scientific writing [58].

The literature review's analysis of using AI tools in scientific collaboration reveals several key themes regarding advantages and disadvantages.

On the advantages side, one category is enhanced efficiency and productivity. AI tools are frequently recognized for their ability to significantly reduce the time and effort required in the writing process, enabling researchers to focus on more complex and intellectually demanding tasks. This includes automating routine activities such as formatting, editing, and initial drafting, as well as streamlining the research process. AI is also crucial in supporting research activities, mainly through advanced tools that aid data analysis, literature reviews, and information synthesis. The tools not only facilitate the research process but also contribute to the robustness and depth of scientific studies. Another significant advantage raised in the literature is the improvement in language and manuscript quality. AI-powered language models are widely acknowledged for enhancing the clarity, coherence, and overall readability of scientific writing. The models help authors prepare scientific content for a broader audience and ensure higher language precision and consistency standards. In addition to the core categories, various miscellaneous benefits are noted, reflecting the diverse ways AI contributes to scientific writing. They include innovations in how research is conducted and communicated and the potential for AI to introduce new methodologies and perspectives in scientific discourse.

The use of AI in scientific writing comes with several significant drawbacks. A major concern revealed in the literature is the risk of fraud and plagiarism. AI tools can be misused to produce large amounts of unoriginal or even deceptive content, which threatens the credibility of scientific work. Ethical issues are also a big part of the conversation, especially when it comes to the integrity of AI-generated content. There is a risk that AI might unintentionally spread biases from its training data, raising questions about fairness and the ethical use of these technologies. Accuracy and validation are other critical issues. While AI can boost productivity, it can also introduce errors if human experts do not carefully review the content. Such a reliance on AI without proper oversight can lead to mistakes that could undermine the quality of research. On top of that, there are concerns about the overall quality of AI-generated writing. Some worry that AI might produce content that is too generic or lacking in depth compared with what a human would write. Finally, there are other downsides, such as the fear that overusing AI might reduce creativity or weaken essential writing and critical thinking skills. While AI has advantages, these challenges show why using it carefully and thoughtfully in scientific research is important.

2.2. Students as AI Users in an Academic Context

Students from Generation Z, who have grown up as digital natives surrounded by the internet, social media, and advanced technology, are highly aware of AI's capabilities. As AI tools are accessible, there is a notable increase in their use for routine writing tasks, such as drafting essays, generating summaries, and conducting research. AI tools are sometimes used to assist with writing exams, contributing to instances of cheating in both online and written assessments [59]. This trend contributes to the blurring of lines between student-generated and AI-generated content, leading to concerns about plagiarism and the authenticity of academic work [60]. It was noted that rapid outcomes provided by AI tools are specifically valued by individuals who prefer quick, efficient AI solutions over methodical approaches. Consequently, this preference may lead to over-reliance on AI, undermining critical thinking, problem-solving, and decision-making skills by reducing engagement with deeper analytical processes [61,62]. However, there are reports that some students become critical and aware of the limitations of AI tools. According to [63], perceptions of ChatGPT were viewed as a potential "cheating tool" (because of a lack of accuracy); however, with careful human oversight and a level of trust, it could be used as a collaborative resource. Critical thinking also concerns the dual nature of AI: students believe that it can be effectively utilized in teaching, learning processes, and academic administration with its limitation or avoidance in certain areas, such as admissions, examinations, and placements [64].

The stealth incorporation of AI into academic practices requires careful consideration and transformation of education, focusing on understanding the underlying motivations and behaviours connected with AI use. The literature mentions transformative actions such as teaching prompt engineering techniques [65], which can be perceived as "acclimating to the new" and adapting to technological advances. Many authors suggest that regulations, policies, standards, and guidelines that define the appropriate use of AI tools are necessary to maintain the integrity of students' work [66–68] and prepare for digital excellence transformation [69]. Such definitions are crucial for ensuring that the next generation of scholars benefits from technological advancements and maintains the intellectual rigour that is the hallmark of academic achievement.

The study on the application of AI in teaching scientific collaboration may bring new insights from students who intend to improve the quality of their academic work. The findings can reveal further research explorations and provide input to ongoing considerations and transformation of educational practices.

3. Materials and Methods

3.1. Procedure

This study was conducted during the "Group collaboration" subject of a spring semester in 2024 at the Faculty of Management and Command of the War Studies University in Warsaw. It employed a qualitative approach using open interviews conducted during class sessions among students in their second year of master's studies. The interviews were designed to capture detailed insights on using AI in scientific collaboration, focusing on writing articles and creating scientific posters. The content of the interviews was transcribed, and the comments were manually labelled, coded, and categorized by a single researcher at two different times. In detail, the process began with labelling the data based on observed patterns, followed by creating detailed codes to identify specific patterns. Through thematic analysis, the codes were grouped into broader categories. The whole procedure underwent an iterative review and refinement after six weeks, ensuring each label, code, and category accurately represented the data and was supported by consistent patterns. NVivo software (Release 1.5.1 (940)) facilitated the entire process. To ensure the reliability and validity of the labelling, coding, and categorization processes, a portion of the records was re-labelled, re-coded, and re-categorized for intra-coder reliability testing. Cohen's Kappa was calculated for each process as follows: 0.74 for labelling (95% CI: 0.68 to 0.80), 0.78 for coding (95% CI: 0.72 to 0.84), and 0.72 for categorization (95% CI: 0.66 to 0.78). These values indicate substantial agreement and confirm the consistency and reliability of the analytical methods used. Figure 1 illustrates the research procedure.

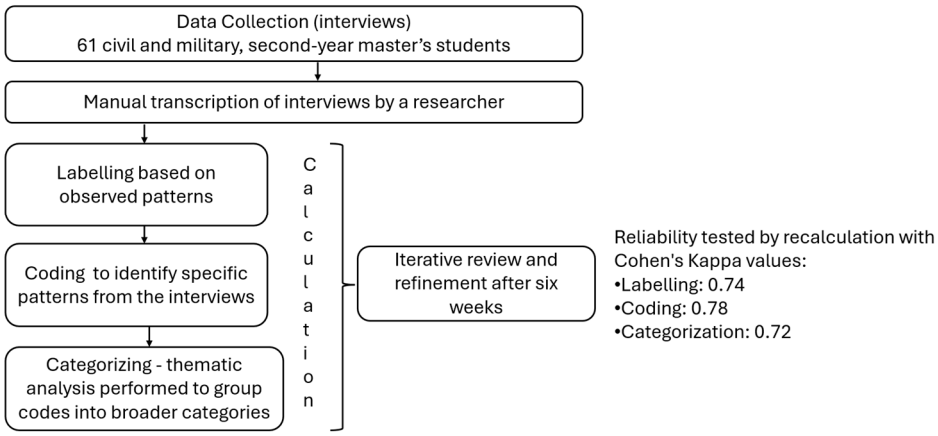


Figure 1. Research procedure.

This study culminated in a student seminar, during which participants presented their AI-aided articles and posters and shared feedback on how AI tools influenced the quality of their academic work.

3.2. Participants

This study involved civil and military students (daily and extramural) enrolled in their second year of master's studies. A total of 61 students participated in this research, providing insights into their experiences with AI tools in the context of scientific writing and poster creation. The students worked in groups, with at least two members per group, and had the option to collaborate with external partners from other universities. Some of the students plan PhD studies. The students provided verbal consent to participate in this study, and this consent was documented through an email from the group leaders in accordance with ethical guidelines.

3.3. Task Design

The assigned tasks relied on creating scientific articles and posters using AI. In the beginning, students were familiarized with various AI tools and the ethical considerations

associated with their use, as well as instructed on accessing scientific databases, adhering to academic styles, and understanding the philosophy behind creating effective scientific posters. Further instructions concerned the potential roles and tasks in a scientific collaboration. To address ethical concerns, students had to explicitly state in their papers and posters that some parts of their work were generated with the assistance of AI. This measure ensured transparency and adherence to academic integrity. A tutor evaluated the articles produced, and some were submitted for publication, contributing to the overall assessment of AI's impact on scientific collaboration.

The task design was developed through a systematic process. First, a needs assessment identified key objectives and requirements for evaluating AI-assisted scientific work and group collaboration. Next, the design underwent pilot testing with a small group of students to identify issues and refine the task instructions. Based on feedback, iterative revisions were made to improve clarity and effectiveness. This approach ensured that the task was well-defined, aligned with academic standards, and capable of accurately measuring the desired outcomes in students' performance.

3.4. AI and Conventional Academic Tools Used

The students used the following tools to write articles and create scientific posters:

- ChatGPT 3.5 and 4.0—to generate ideas, prompt, and evaluate.
- Hemingway Editor—to improve readability.
- Canva—to design scientific posters (with the AI text function).
- DeepAI—to design scientific posters.

These tools helped students enhance their collaborative projects by providing various functionalities to streamline the writing, editing, and design processes. In addition, they used conventional tools such as Google Scholar, Scopus, and Web of Science databases to search the literature and for citation assistance.

4. Results

The data gathered from 61 student responses were categorized into various themes to reflect how AI tools were utilized and perceived. The comments were grouped under specific codes (nine) and categories (three) that illustrate the range of applications, benefits, challenges, and overall impact of AI on their academic work. Table 3 includes categories, codes, number of labels, and 27 exemplary comments. The quantity of labels in the student responses indicates how frequently specific concepts or ideas appeared across the data. This metric helped identify the most prevalent ideas and how often students expressed certain viewpoints or notions.

Table 3. Identification of categories, codes, labels, and exemplary answers of students.

Category	Code	Number of Labels	Exemplary Comments
Positive impact on collaboration	Improved efficiency	10	"AI tools significantly accelerated our writing process, making it easier to meet deadlines". "We noticed a substantial reduction in the time needed to create our scientific poster using AI". "The AI-generated suggestions helped streamline our collaborative efforts".
	Enhanced quality of work	8	"AI provided insightful data analysis, which enhanced the overall quality of our article". "The poster's design was far more professional thanks to AI's assistance". "Using AI for editing improved the clarity and coherence of our manuscript".
	Generated new ideas	6	"AI tools generated numerous innovative ideas that we incorporated into our research". "The brainstorming sessions were more productive with AI assistance". "AI helped us explore different angles we hadn't considered for our article".

Table 3. *Cont.*

Category	Code	Number of Labels	Exemplary Comments
Challenges faced	Technical difficulties	9	"We encountered several technical issues while integrating AI tools into our workflow". "The learning curve for some AI software was steep, causing initial delays". "Our team had to spend extra time troubleshooting AI-related problems".
	Dependence on AI	7	There was a tendency to rely too heavily on AI, which affected our critical thinking skills". "Some team members felt less engaged because they relied more on AI than collaboration". "AI can be engrossing, addictive and time-consuming when exploring the issue in the right direction. It's like a drug".
	Inconsistency in AI outputs	5	"AI-generated content sometimes lacked consistency, requiring additional revisions". "We found discrepancies in data interpretation by different AI tools". "The AI's suggestions were occasionally irrelevant or off-topic".
Educational impacts	Learning new skills	8	"The use of AI taught us valuable skills in handling advanced technological tools". "We learned how to integrate AI into scientific research methodologies better". "Our project management skills improved significantly with AI tools".
	Increased engagement (in the task)	6	"AI made the project more engaging and interactive for the entire team". "We felt more motivated to experiment with AI tools during our collaboration". "The novelty of using AI kept us interested and focused on our tasks".
	Critical thinking enhancement	5	"AI encouraged us to think more critically about the data we were handling". "Our analytical skills were honed as we assessed AI-generated outputs". "Using AI pushed us to question and validate the information more thoroughly".

The exploration of the students' perspectives on using artificial intelligence (AI) in scientific collaboration resulted in the identification of three categories. For the first category, "Positive impact on collaboration", which reflects positive sentiment, the codes were "Improved efficiency" (10 labels), "Enhanced quality of work" (8 labels), and "New ideas generation" (6 labels). The students reported that AI tools significantly accelerated their writing processes, reduced the time required to create scientific posters, and streamlined collaborative efforts. They also noted that AI's data analysis capabilities and editing tools enhanced their work's overall quality and clarity. Additionally, AI-assisted brainstorming led to the generation of innovative ideas and the exploration of new angles in their research.

Despite the positive attitude, integrating AI tools into the students' collaboration revealed "Challenges faced", the name of the second category. It included "Technical difficulties" (nine labels), "Dependence on AI" (seven labels), and "Inconsistency in AI outputs" (five labels). The students encountered several technical issues, such as a steep learning curve and the need for troubleshooting, which initially delayed their progress. There was also a concern about over-reliance on AI that borders on addiction, which, in further steps, affected critical thinking. Moreover, inconsistencies in AI-generated content required additional revisions and sometimes led to irrelevant or off-topic suggestions.

The last category, "Educational impacts", reflects implications for the students' learning. The identified codes were "Learning new skills" (eight labels), "Increased engagement" (six labels), and "Critical thinking enhancement" (five labels) as significant outcomes. The students reported gaining valuable skills in handling advanced AI tools and integrating them into scientific research methodologies, which improved their project management capabilities. The novelty and interactivity of AI tools kept the students engaged and motivated throughout the collaboration. In addition, using AI encouraged them to think more critically about the data, hone their analytical skills, and validate information more thoroughly.

Overall, the findings highlight the dual nature of AI's role in scientific collaboration. While AI tools offer substantial benefits regarding efficiency, quality, and idea generation, they also pose challenges that must be managed.

5. Discussion and Further Implications

The statements listed in the table reflect various aspects of student collaboration. While many comments focus on individual experiences, the highlighted themes, such as improved efficiency, quality of work, and generation of new ideas, are directly related to collaborative efforts. These statements illustrate how AI tools facilitated group work by streamlining processes, enhancing the quality of outputs, and fostering innovation within the team. Additionally, the challenges students faced—such as technical difficulties, over-reliance on AI, and inconsistencies in AI outputs—also impacted collaboration, sometimes leading to delays and reduced engagement in team efforts. Finally, the educational impacts, including learning new skills and enhanced critical thinking, demonstrate that AI tools supported collaboration and contributed to developing essential collaborative competencies, such as problem-solving and managing group dynamics.

These results suggest that while AI can enhance collaboration, it also requires careful management to avoid over-reliance, spending too much time with AI chatbots, and ensuring the accuracy of AI-generated content. It can be noticed that the results reflect the actual state of research concerning the advantages and disadvantages of using AI tools in scientific work. It also supports the need to transform technology use in the classroom by setting rules, standards, and policies. The results also revealed that extensive use of AI chatbots may lead to addiction, negatively affecting cognitive skills and making information retrieval more exhausting, specifically because of inadequate prompting and constant efforts to refine outputs.

This study had four major limitations. The first relates to a relatively small sample size of 61 participants, which may not represent the broader student population. Such a limited sample size could affect the generalizability of the findings. The second is the reliance on self-reported data, which may cause a social desirability bias [70], according to which students could provide responses they were expected rather than their actual experiences. The qualitative nature of this study, while rich in detail, may be subject to interpretation biases by a single researcher, which is the third limitation. The fourth limitation is connected with the fact that the students' immediate experiences and perceptions were captured in the research procedure. Longitudinal and more complex studies could provide more comprehensive insights into students' perceptions of AI tools in academic work.

Therefore, further research should address ethical concerns encompassing intellectual property rights, algorithmic biases, and individuals' motivations for using AI in scientific collaboration. As far as the higher education context is concerned, ethical deliberations can be focused on how AI can be integrated into various stages of the scientific process, from research questions and hypothesis generation [71] to data retrieval and summarizing [72]. Related to the issue is the motivation for using AI tools. This includes investigating whether students utilize AI for "copy and paste" content "to improve efficiency" (as mentioned in Table 3 in the "Positive impact on collaboration" category) or to gain preliminary insights into new topics for later discussion ("Generation of new ideas"). Understanding these motivations will help clarify the ethical implications of AI usage in academic settings. For this reason, researchers develop instruments that determine the motivations of university students to use artificial intelligence applications [73]. Some studies on this topic revealed that motivations are "academic content creation", "information seeking", "novelty", and "convenience" [74]. Nevertheless, the area requires deeper investigations to provide more comprehensive insights into these motivations and their implications, helping to develop more effective guidelines and policies for the ethical use of AI in academic settings.

Promoting responsible use is another direction for future research. To achieve this, researchers must establish clear guidelines and ensure fair access for all collaborators. They should monitor for biases and address any issues that arise to prevent unfair out-

comes. Designing and implementing specialized collaboration platforms can support these objectives. Such AI-driven platforms that dynamically adapt to the evolving needs of researchers [75,76] can provide real-time support and resources to researchers and facilitate communication and coordination among geographically dispersed teams.

Finally, a detailed investigation of human–machine interactions is worthwhile, namely, how students' emotions, cognitive processes, and behaviours influence their interactions with AI tools. This study revealed that the convenience and efficiency offered by AI can lead to a positive emotional response, making students feel more accomplished and less stressed about their workload. However, this ease of use also fostered a sense of complacency, where students became overly reliant on AI to complete tasks that they would otherwise engage with more deeply. Extensive reliance on AI may be treated as an addiction, and this direction could be explored, specifically in the context of academic performance. Furthermore, students' susceptibility to overuse of AI tools can be influenced by their anxiety levels, time pressures, and the perceived difficulty of assignments. In high-stress academic environments, students may increasingly turn to AI as a coping mechanism, potentially leading to a pattern of dependence [77]. Understanding the emotional dynamics and potential for overuse is crucial for educators and institutions seeking to integrate AI into the learning process responsibly. Therefore, it is crucial to conduct a more thorough investigation into how AI-enhanced collaboration impacts individuals, particularly in terms of which personality types might experience benefits or drawbacks. Additionally, it could be worth exploring how long-term versus short-term professional goals may influence susceptibility to addictive behaviours related to AI use.

This study offers practical recommendations for educators and policymakers to integrate AI effectively into academic practice. First, educators should set clear guidelines and provide training on using AI tools in group work. Training should focus on helping students use AI as a supportive resource without becoming overly dependent, ensuring it enhances collaboration rather than replacing it.

Second, policymakers need to prioritize research into AI's ethical and psychological impacts on students. Developing strategies to manage risks of overuse and dependency will help ensure that AI supports learning without hindering cognitive engagement. Implementing these steps will enable both educators and students to maximize the benefits of AI while addressing potential challenges.

6. Conclusions

This study offers valuable insights into the role of AI in enhancing scientific collaboration among students. AI tools contributed to improved efficiency, quality of work, and idea generation during the process of writing articles and creating scientific posters. However, challenges like technical difficulties, inconsistencies in AI outputs, and over-reliance on AI were also prominent. These issues highlighted the need to balance AI use to avoid diminishing students' critical thinking and engagement. Educationally, the use of AI fostered skill development, increased engagement, and promoted critical thinking. This suggests that AI can be a powerful tool for collaboration, provided that its use is managed effectively. Overall, the findings underscore that while AI can enhance collaboration, its effectiveness depends on careful management and proper training. Both should involve ethics related to students' motivations, promoting and facilitating the responsible use of AI tools, and attention to emotions, cognitive processes, and behaviours resulting from interaction with AI.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/educsci14101132/s1.

Funding: This research was funded by War Studies University, Grant "Statutory Research 2024" No. II.2.117 (121).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The author declares no conflicts of interest. The funders had no role in the design of this study; in the collection, analysis, or interpretation of the data; in the writing of this manuscript; or in the decision to publish the results.

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