Using ChatGPT to Write Scientific Papers in Indonesia: A Systematic Review

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ABSTRACT

Background: The utilisation of ChatGPT in writing scientific papers has sparked both pros and cons in Indonesia. Some studies reveal its great potential, while others highlight the negative impacts resulting from its use.

Objective: This research aims to analyse the area, impact, and trends in the use of ChatGPT in writing scientific papers in Indonesia through a systematic review.

Methodology: Researchers use Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to conduct the analysis. The sample consists of 19 selected studies collected from the Google Scholar and Scopus databases.

Result: The research results show that the areas in which ChatGPT is used in writing scientific papers include topic selection, reference search, data analysis, scientific grammar, and translation. The use of ChatGPT in writing scientific papers faces some serious challenges, especially those related to ethics and academic integrity, such as increasing rates of plagiarism and declining values of honesty and responsibility. Moreover, dependence on Artificial Intelligence technology can potentially reduce the development of human intellectual abilities, such as critical thinking, analysis, interpretation, and logic.

Conclusion: The utilisation of ChatGPT in academic writing in Indonesia has both positive and negative aspects. Regulation and morality can be crucial keys to realising a quality academic environment.

Unique Contribution: This research contributes to understanding the opportunities and challenges of utilising ChatGPT in writing scientific papers and provides information regarding areas that have the potential for further research.

Key Recommendation: To minimise risks while still maximising ChatGPT's positive potential, an in-depth understanding of the appropriate regulations for using it in writing scientific papers is needed.

Keywords: ChatGPT, writing scientific papers, artificial intelligence, systematic review

Introduction
Various reactions emerged from educational practitioners since ChatGPT appeared at the end of 2022. Some expressed their agreement with enthusiasm, seeing the great potential in using this technology to improve student's learning experiences; on the other hand, some rejected the idea of using ChatGPT in education. The educational practitioners who accept it see ChatGPT as a tool that can facilitate more personalised learning, assist students in understanding concepts, and provide additional support in solving problems. Meanwhile, those who reject it assume that too much reliance on technology can reduce the important role of teachers in the teaching and learning process. In addition, some argue the necessity to consider ethical, privacy, and data security issues, especially since ChatGPT works using collected data.

Artificial intelligence, including ChatGPT, always has positive and negative impacts, especially when writing scientific papers. ChatGPT is very helpful in exploring ideas quickly and efficiently, increasing productivity, and encouraging innovation in writing (Salvagno et al., 2023; Florindo, 2023; Sufendi & Rahmat, 2023). Moreover, ChatGPT can help create writing prompts, provide feedback and revision suggestions, and offer writing assistance (Madina et al., 2023; Sumakul et al., 2022). ChatGPT helps authors correct language errors and the readability of articles (Seghier, 2023; Zen et al., 2023). In addition, ChatGPT helps researchers write manuscripts that are coherent, partially accurate, informative, and systematic (Zhai, 2023; Lund & Wang, 2023). ChatGPT is also able to work well for exploring ideas, creating writing prompts, correcting errors, writing abstracts, and presenting alternative arguments, but not for presenting credible references (Soni & Wade, 2023; Kim & Kim, 2022). Therefore, ChatGPT is very helpful in exploring ideas and writing techniques but cannot guarantee the credibility of the references used. As an Artificial Intelligence technology, ChatGPT relies heavily on available information databases.

The use of ChatGPT leaves a lot of fictitious space or "hallucination", especially in the presentation of references (Babl & Babl, 2023; Elali & Rachid, 2023). Although ChatGPT can provide a fast response, its tendency to produce erroneous information must be taken into account due to its limited information database. Apart from that, ChatGPT can have many other negative impacts if not used wisely. Experts worry that ChatGPT is being misused for plagiarism, which makes researchers dependent and lazy (Qasem, 2023). In addition, experts highlight issues of academic integrity and plagiarism (Setiawan & Luthfiyani, 2023;Yeo, 2023;Ventayen, 2023). Even though ChatGPT is more advanced than search engines, it is still below the search engine level since it is not responsible for the articles produced (Lee, 2023).

Even though there are pros and cons, many parties in Indonesia have used ChatGPT to write scientific papers. This is proven by publications related to using ChatGPT to write scientific papers in Indonesia. These studies revolve around various aspects, including how ChatGPT can be used to help researchers and academics produce quality scientific work, correct grammatical and writing style errors, and provide suggestions that enrich written content. Even though the numbers are limited, the data from these studies can provide a clear picture of the potential and challenges of using ChatGPT in the context of writing scientific papers in Indonesia.

The diverse research findings related to the utilisation of ChatGPT in writing scientific papers in Indonesia reveal significant variations in conclusions and perspectives. This necessitates a systematic review to comprehensively collect, evaluate, and analyse the existing literature. It is important to conduct this review to identify the areas of usage, impacts, benefits, and challenges associated with the utilisation of ChatGPT. By doing so, it aims to provide a deeper and more valuable understanding that can contribute to the advancement of scientific knowledge and the practice of writing scientific papers in Indonesia.

Objectives of the Study
Based on this background, this systematic review aims to analyse:
1) the general description of scientific research on the use of ChatGPT for writing scientific papers in Indonesia;
2) the benefits and challenges of using ChatGPT for writing scientific papers in Indonesia; and
3) future trends and emerging research areas related to the use of ChatGPT for writing scientific papers in Indonesia.

Method
The researcher used Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to conduct a systematic review with a planned and systematic search strategy and a directed inclusion and exclusion process (Page et al., 2021).

Search Strategy
Searches use search keywords in the title, abstract, and Google Scholar and Scopus databases. A literature search was conducted from February to April 2024, and 812 studies were successfully identified.

Table 1. Search Strategy

Topic	Search Terms
ChatGPT	"ChatGPT" or "Chatbot" or "Artificial Intelligence"
Context	"Scientific Paper" or "Scientific Writing"

Inclusion and Exclusion Criteria
To ensure that the selected studies were relevant and appropriate for the analysis, inclusion and exclusion criteria were set for the 812 identified studies.

Table 2. Inclusion and Exclusion Criteria

	Inclusion Criteria	Exclusion Criteria
Publishing period	Published in 2022 – now (April 2024)	Published before 2022
Document Type	Scientific articles published in peer-reviewed journals and indexed by Google Scholar or Scopus	Other than scientific articles published in peer-reviewed journals and indexed by Google Scholar or Scopus
Research type	Theoretical and empirical research	Other than theoretical and empirical research
Language	Indonesian and English	Other than Indonesian and English
Research topic	The use of ChatGPT in writing	Other than the use of ChatGPT in

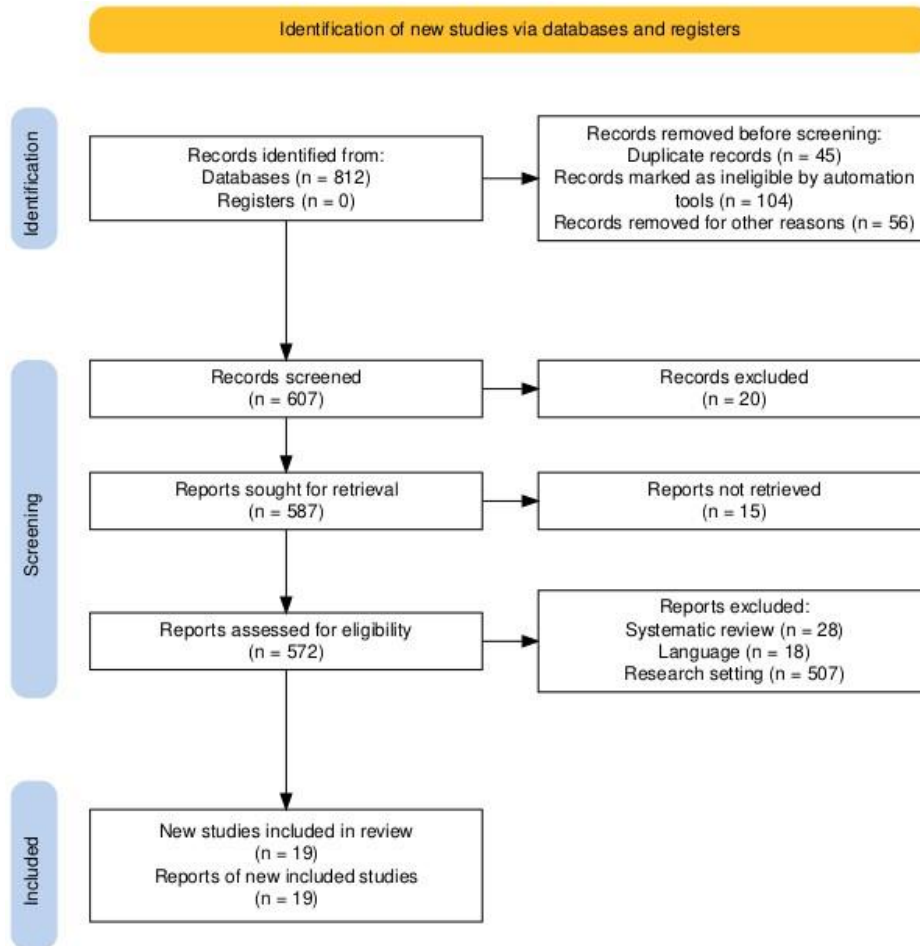|	scientific papers	writing scientific papers
Research setting	Indonesia	Other than Indonesia

Research Selection

Figure 1. Flow Chart of Research Selection Process

Data Analysis
To address the research questions, the researchers conducted a content analysis that combined both qualitative and quantitative approaches on the 19 research studies obtained. The quantitative analysis aimed to visualise and comprehend general aspects of the topic through descriptive graphs. The qualitative analysis utilised the VOSviewer 1.6.20 software to identify the main trends and scientific impact within the research field. Analysis was done using co-occurrence (keyword analysis) with a minimum number of keywords read. The output analysed is in the overlay visualisation (research keyword trends) and density visualisation (research keyword density). The characteristics of the research analysed are shown in Table 3.

Table 3. Characteristics of The Research Analysed

Author, Year	Title of Journal	Source	Method	Findings	
				Opportunity	Threat
Supriyadi (2022)	*Papanda Journal of Mathematics and Sciences Research (PJMSR)*	Google Scholar	Qualitative		The article plagiarism rate is very high.
Utami et al. (2023)	*Contemporary Educational Technology*	Scopus	Mixed method	Help students to do academic research, especially in the planning step, to identify and develop the topics, as well as in the drafting step, to develop a paper draft.	
Setiawan & Luthfiyani (2023)	*Jurnal PETISI*	Google Scholar	Qualitative	ChatGPT can help write scientific papers well and effectively and bring happiness to students.	It is potentially eroding positive characteristics such as honesty, trustworthiness, and responsibility.
Marzuki et al. (2023)	*Cogent Education*	Scopus	Qualitative	Artificial Intelligence positively enhances the quality and organization of students' writing.	
Sufendi & Rahmat (2023)	*Edukatif: Jurnal Ilmu Pendidikan*	Google Scholar	Theoretical	ChatGPT has great potential to increase efficiency, creativity, and the quality of students' writing scientific papers.	Ethical challenges, authenticity, and the development of human intelligence.
Veddayana et al. (2023)	*Ghâncaran: Jurnal Pendidikan Bahasa dan Sastra Indonesia*	Google Scholar	Theoretical	Improving the quality of writing scientific papers.	Undermining creativity, ability to analyse and interpret, deep understanding of context, unique writing style, and critical thinking

					using logic.
Febriani et al. (2023)	*Idarah Tarbawiyah: Journal of Management in Islamic Education*	Google Scholar	Qualitative	ChatGPT can help analyse data by adjusting the context.	
Patty et al. (2023)	*Community Development Journal*	Google Scholar	Participatory action research	Improving the ability to write scientific papers, productivity of scientific publications, and contributing to the development of science and education at local and national levels.	Continuous monitoring to develop the ability to use Artificial Intelligence effectively.
Kusumanin grum et al. (2023)	*Community Development Journal*	Google Scholar	Qualitative	ChatGPT features are felt to be able to encourage academics to learn independently, search for information to produce ideas, help in writing texts.	Increased plagiarism rate.
Waluyo et al. (2023)	*Jurnal TIK dalam Pendidikan*	Google Scholar	Qualitative	Helping find and recommend research topics	
Zen et al. (2023)	*Tematik: Jurnal Teknologi Informasi Komunikasi*	Google Scholar	Qualitative	Chatbots have many uses in writing scientific papers including hypothesis generation, literature review, problem-solving, paraphrasing and summarizing, editing, and journal selection.	Risk of plagiarism and inaccuracy, as well as potential imbalances in accessibility.
Utomo (2023)	*JalinMas: Jurnal Kolaborasi dan*	Google Scholar	Participatory action research	Improving scientific paper writing skills.	

	Pengabdian Masyarakat				
Muslimin (2023)	*Journal of Educational Management and Instruction*	Google Scholar	Quantitative	ChatGPT can increase the productivity of scientific articles for students.	
Ningsih & Syaharuddin (2024)	*Tamora Community Services*	Google Scholar	Participatory action research	Making it easier to write scientific papers.	
Kaharuddin et al. (2024)	*Journal of Language teaching and Research*	Scopus	Quantitative	Artificial Intelligence plays a mediating role in explaining the effects of reading and feedback on writing skills.	
Diana et al. (2024)	*Pandawa: Pusat Publikasi Hasil Pengabdian Masyarakat*	Google Scholar	Participatory action research	Enriching the writing scientific papers process.	Plagiarism must be balanced with supporting software such as Turnitin.
Febrian et al. (2024)	*Community Development Journal*	Google Scholar	Participatory action research	Makes it easy to create national journal manuscripts, from title selection to commentary.	
Aeni et al. (2024)	*Didaktik: Jurnal Ilmiah PGSD FKIP Universitas Mandiri*	Google Scholar	Qualitative	ChatGPT can translate scientific texts in the very good category.	
Ismain & Jabri (2024)	*Majesty*	Google Scholar	Qualitative	ChatGPT plays a role in supporting the writing of scientific articles by providing fast and detailed feedback, helping identify the right solution, and improving the quality of writing.	Potential inappropriateness of feedback generated by AI systems.

Results and Discussion
General Description of Research on Using ChatGPT to Write Scientific Papers
The systematic review selected 19 studies related to the use of ChatGPT in writing scientific papers. Of these, 5.26% were published in 2022, 63.16% in 2023, and 31.58% in 2024 (Figure 2). This shows that research related to the use of ChatGPT when it first appeared at the end of 2022 was still very limited. In 2023, there was a significant increase, and this trend continued until early 2024.
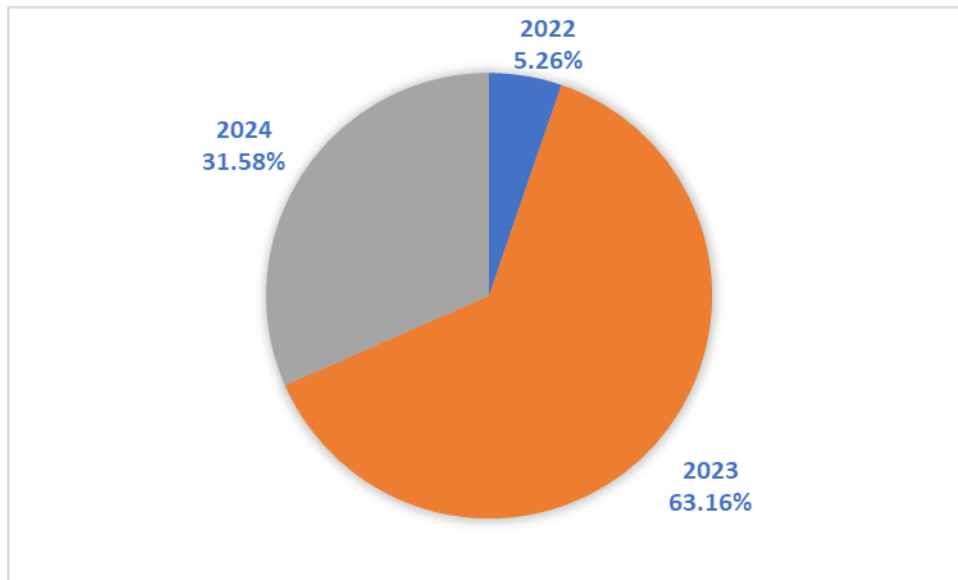

Figure 2. Distribution of Studies by Year of Publication

There are four approaches used in research related to the use of ChatGPT in writing scientific papers, namely quantitative (10.53%), qualitative (47.37%), mixed method (5.26%), theoretical (10.53%), and participatory action research (26.32%) (Figure 3). A quantitative approach measures the productivity of scientific papers written using ChatGPT. A qualitative approach explores how a community uses ChatGPT to write scientific papers. The theoretical approach focuses more on ethical issues and the fading aspects of the "human touch", such as creativity, critical thinking, and logic in writing scientific papers. Meanwhile, participatory action research reveals more about the impact of training on using ChatGPT in writing scientific papers. With this approach, participants become research subjects and act as part of the research process, providing their input, experiences, and perspectives on using ChatGPT in the context of writing scientific papers. This allows researchers to understand better how the training influenced participants' attitudes, knowledge, skills, and behaviour in using ChatGPT.
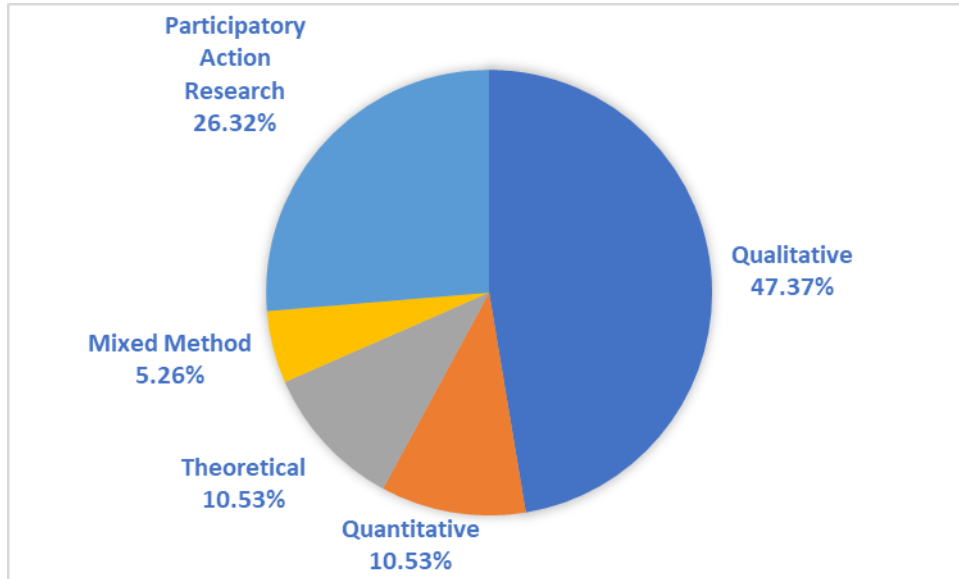
Figure 3. Distribution of Studies by Methodology

ChatGPT in writing scientific papers has been used by various groups, including students (78.95%), teachers (15.79%), and the public (5.26%) (Figure 4).
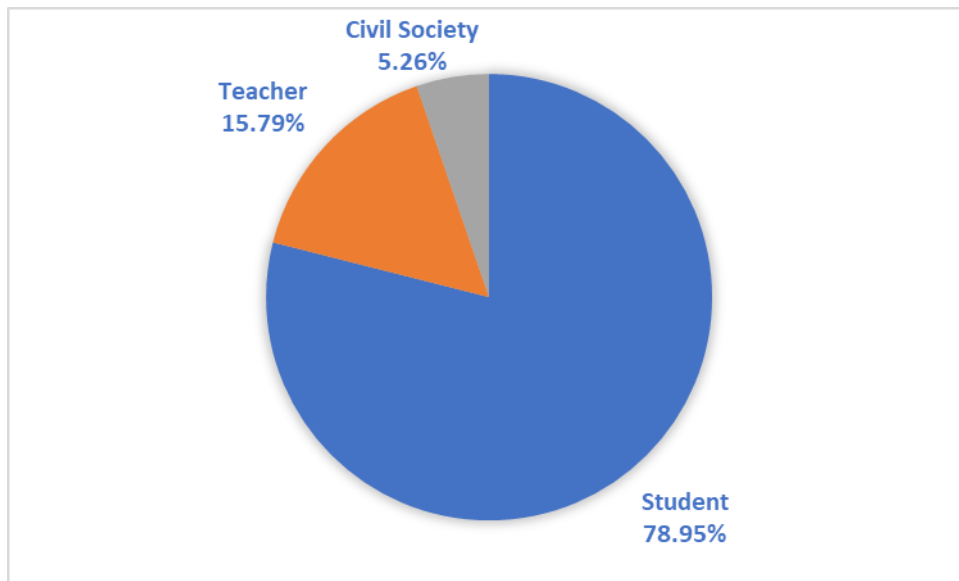

Figure 4. Distribution of Studies by Subject

Figure 4 shows that academics in universities have used ChatGPT technology, which has attracted interest from various segments of society, such as teachers in schools, lecturers in higher education institutions, and even the public outside formal education environments. This diversity of users reflects the broad relevance and potential of ChatGPT in supporting the writing of scientific papers process from various groups. In addition, this describes its ability to be a useful tool in supporting writing and communication activities in various contexts. Therefore, the use of ChatGPT in writing scientific papers not only expands the accessibility of information and

assistance in writing but also reflects the digital transformation that is increasingly pervasive in various levels of society.

Benefits and Challenges of Using ChatGPT to Write Scientific Papers
The synthesis results show that many opportunities can be generated by using ChatGPT to write scientific papers. ChatGPT can help write well and effectively, thereby increasing efficiency, creativity, and writing quality (Setiawan & Luthfiyani, 2023; Sufendi & Rahmat, 2023; Veddayana et al., 2023; Utomo, 2023; Ningsih & Syaharuddin, 2024). With its ability to generate text based on the prompts provided, ChatGPT can increase writing efficiency by providing ideas and structures that can be used as a basis for further writing (Marzuki et al., 2023). ChatGPT has been proven to paraphrase and edit writing using scientific principles (Zen et al., 2023; Febrian et al., 2024). Using advanced natural language processing technology, ChatGPT can generate alternative sentences or paragraphs that express the same meaning differently without changing the substance of the information conveyed. Apart from grammatical aspects, ChatGPT can produce accurate and cohesive translations from the source language to the target language (Aeni et al., 2024). With this capability, ChatGPT can reduce the time and effort required in the translation process while maintaining the integrity of the original text's meaning.

ChatGPT can help with topic selection, hypothesis formulation, literature review, problem-solving, and selection of research references to formulate conclusions (Utami et al., 2023; Febrian et al., 2024). This increases efficiency in writing and allows researchers to access important information more easily and quickly. Therefore, ChatGPT becomes a useful tool in assisting researchers in compiling structured, cohesive, and informative scientific work.

However, problems related to the many fictitious spaces or "hallucinations" generated by ChatGPT, especially in reference searches, must be of serious concern (Kim & Kim, 2022). This phenomenon refers to situations where ChatGPT can produce inaccurate or invalid information, especially in statements requiring a strong theoretical basis. Therefore, when using ChatGPT for research purposes or information that requires accuracy, it is recommended that additional verification of the references provided be carried out so as not to be trapped in the space of false or fictitious information.

Even though it has great benefits, several research results reveal the big challenges of using ChatGPT in writing scientific papers. Plagiarism is the most frequently encountered challenge as a result of using ChatGPT in writing scientific papers (Supriyadi, 2022; Kusumaningrum et al., 2023; Zen et al., 2023; Diana et al., 2024). As an advanced language model, ChatGPT allows users to generate text that is very similar to the text in the source. This makes writers tend to copy texts from existing sources without making significant changes. In addition, the risk of plagiarism arises when translating references from the source language to the target language. However, the worst possibility is that writers become too dependent on ChatGPT in the writing process and end up not doing enough checks on the authenticity of their work.

Dependence on technology in writing scientific papers has the potential to erode positive characteristics such as honesty, trustworthiness, and responsibility (Setiawan & Luthfiyani, 2023). This dependency ultimately discredits ethics, the development of human intelligence, critical thinking abilities, analytical and interpretive abilities, and logic (Sufendi & Rahmat,

2023; Veddayana et al., 2023). Using ChatGPT without a proper understanding of writing ethics can compromise scientific integrity. The process of manual writing, research, and compiling ideas and arguments, which should be an integral part of the development of human intelligence, can be neglected. The logic of reasoning in constructing arguments, formulating hypotheses, and compiling research methods is reduced if the author relies too much on generative models such as ChatGPT, which also have the potential to provide inadequate feedback (Ismain & Jabri, 2024). Therefore, scientific writers must understand when and how to use ChatGPT wisely while maintaining ethical standards and human intelligence in developing scientific knowledge.

Trends and Future Areas of Research Topics for Using ChatGPT to Write Scientific Papers
The Overlay visualisation results are used as a reference for identifying and detecting the state of the art from research related to the use of ChatGPT in writing scientific papers published in 2022-2024 (Figure 5).
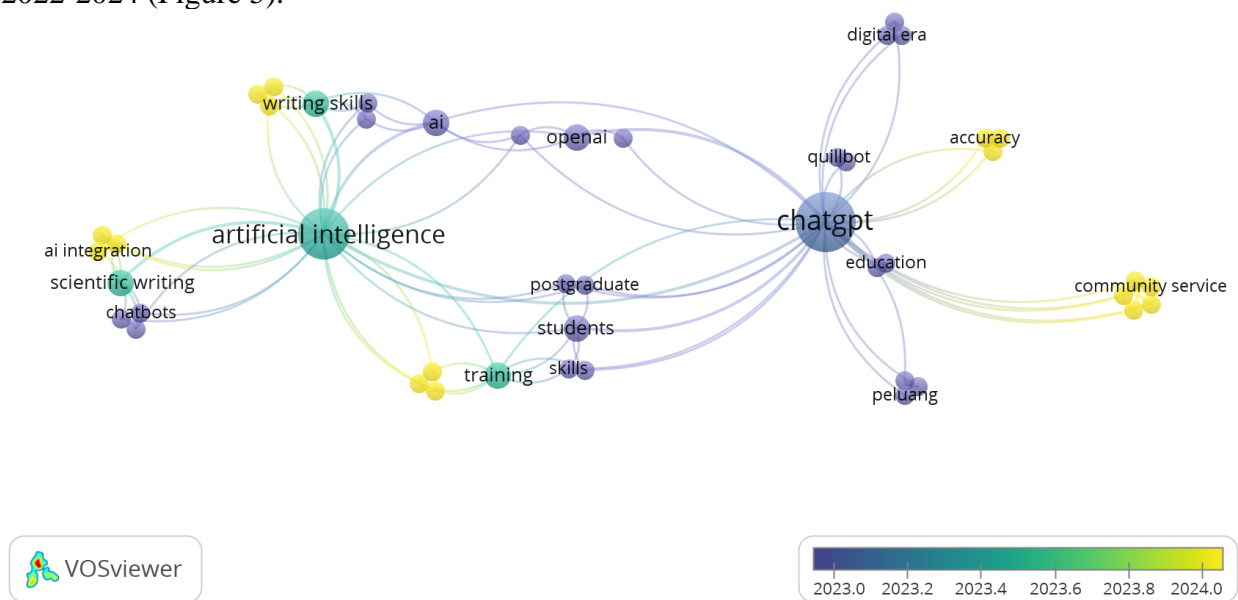

Figure 5. Overlay Visualisation of Research Topics

Research trends in early 2023 are depicted with a blue visualisation overlay, including the keywords of ChatGPT, education, digital era, Quillbot, opportunities, open AI, postgraduate, students, skills, Artificial Intelligence, and chatbots. Research trends in mid to late 2023 are depicted with a green visualisation overlay, including Artificial Intelligence, scientific writing, and training keywords. Meanwhile, research trends in early 2024 are depicted with a yellow visualisation overlay, including the keywords of ChatGPT, AI integration, community service, and accuracy.

Research in early 2023 was dominated by issues regarding the use, opportunities, and challenges of using ChatGPT in the educational sector. Moreover, the research results in this period talk a lot about academic ethics in using ChatGPT. Several research results show deep concern about the erosion of academic integrity, logical thinking ability, and creativity. In mid to late 2023, much research focused on how Artificial Intelligence technologies such as ChatGPT can be applied in the context of student learning and development (Waluyo et al., 2023; Zen et al., 2023;

Muslimin, 2023). The issue raised a lot in this period was related to the operationalisation of ChatGPT in assisting the writing of scientific papers process, either theses or journal manuscripts. Meanwhile, in 2024, the research issues were dominated by training on using ChatGPT to improve writing skills (Diana et al., 2024; Febrian et al., 2024; Aeni et al., 2024). This research, which is packaged in a participatory action research model, practically aims to improve writing skills with ChatGPT.

The density visualization (Figure 6) depicts the level of research saturation related to the use of ChatGPT in writing scientific papers in the period 2022-2024.
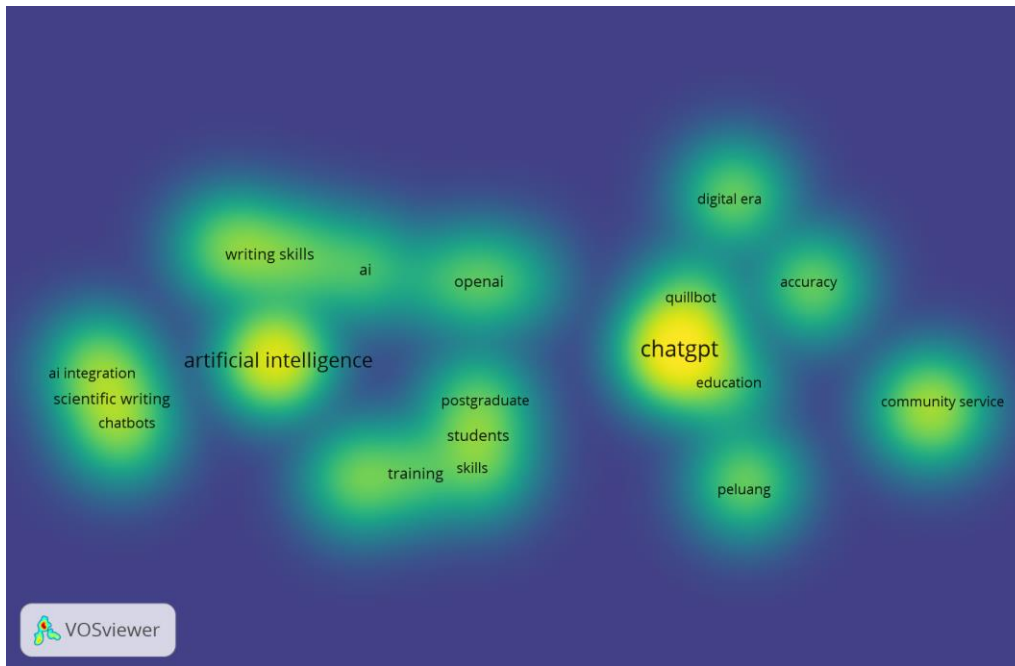

Figure 6. Density Visualisation of the Research Topics

The level of saturation identified in the number of keywords is marked in bright yellow, indicating that the area is a topic that has been widely researched, for example, ChatGPT and Artificial Intelligence. Meanwhile, those marked in yellow tend to be vague, indicating that these topics have not yet been widely researched, such as community service, accuracy, digital era, open AI, AI integration, skills, and training. This suggests there is great potential for further research in these areas, which could provide valuable insights into the development of the use of ChatGPT in academic and scientific contexts. Some potential research topics that can be carried out include 1) the accuracy of ChatGPT in generating scientific texts that comply with standards, 2) the integration of ChatGPT to facilitate scientific collaboration, and 3) the use of ChatGPT in training students' writing skills in the digital era. With comprehensive research, it is expected that the potential of Artificial Intelligence technology, such as ChatGPT, in improving the quality, efficiency, and accessibility of writing scientific papers can be further realised, as well as having a positive impact on the progress of education and research.

This research contributes significantly to understanding the use of Artificial Intelligence technology, particularly ChatGPT, in writing scientific papers in Indonesia. Through a

systematic analysis, this study identifies several key areas where ChatGPT is utilised, such as topic selection, reference search, data analysis, scientific grammar, and translation. This provides new insights for researchers and academics on the potential of Artificial Intelligence technology in various stages of writing scientific papers. The study also reveals ethical challenges and academic integrity issues that arise from using ChatGPT. These findings are important for deepening the discussion on how technology can impact academic norms and values, including the risks of increased plagiarism and the decline in values of honesty and responsibility.

Despite the low density of research topics, the research highlights the growing trend of using ChatGPT in scientific paper writing. This information opens up opportunities for further research to explore the use of ChatGPT across different disciplines and contexts. The unique contribution of this study lies in identifying the opportunities and challenges of leveraging ChatGPT to write scientific papers. It provides valuable information that can be used to develop appropriate policies and regulations, thereby maximising the positive potential of this technology while minimising potential risks. The recommendation to gain a deeper understanding of appropriate regulations is also an important contribution, given the need for clear and comprehensive guidelines in the academic use of Artificial Intelligence.

Overall, this research enriches the scientific literature by providing a comprehensive perspective on the use of ChatGPT in scientific paper writing and its accompanying ethical, academic, and regulatory implications. This contribution is crucial in forming a more holistic and critical understanding of integrating Artificial Intelligence technology into the academic world, particularly in the context of writing scientific papers in Indonesia.

Conclusions
The results of a systematic review show that research related to using ChatGPT to write scientific papers in Indonesia is still limited. However, the number continues to increase from year to year, from 2022 to 2024. Apart from formal educational institutions, ChatGPT is also used to write scientific papers in community-based non-formal education. There are many benefits to using ChatGPT for writing scientific papers, such as topic searches, literature searches, data analysis, paraphrasing, and translation. Apart from that, ChatGPT is believed to be able to bring joy to students in the learning process of writing scientific papers. However, using ChatGPT raises various challenges, especially those related to ethics and academic integrity, such as high plagiarism rates and the decreased values of honesty and responsibility. Reliance on artificial intelligence technology can also discredit the development of human intelligence, critical thinking abilities, analytical and interpretation abilities, and logic. Therefore, there is a need for an in-depth understanding of the appropriate regulations for using ChatGPT in writing scientific papers to minimise these risks while still maximising its positive potential.

The main limitation of this research is the limited amount of literature as material for analysis. This is because the trend of using ChatGPT in writing scientific papers has not been widely implemented amidst the pros and cons in Indonesia. As shown in the analysis results, topics related to the use of ChatGPT in writing scientific papers still have a fairly low density level, so there are still opportunities for further research. However, this research is expected to become a scientific reference for formal and non-formal education in Indonesia using ChatGPT to write

scientific papers. In the future, this research can be expanded to research databases to enrich the number of manuscripts and the coverage of areas analysed.

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