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The use of ChatGPT to improve scientific article productivity of postgraduate students

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ABSTRACT

The application of Artificial Intelligence (AI) in education is increasingly promising. ChatGPT as an AI-based platform that can answer all questions can be a solution for learners. This article examines the use of ChatGPT in increasing the productivity of scientific articles of Postgraduate Students of IAIN Kediri. This study used a quasi-experimental design, with the experimental group engaging in scientific article writing using ChatGPT and the control group doing it conventionally. The sample of this study was 2nd semester Postgraduate Students of Islamic Education Management Study Program IAIN Kediri. Data were collected through initial and final tests in scientific article writing. Descriptive and inferential statistical analysis was conducted to analyze the data. The results showed that the average score of the experimental group was 82.68 while the control group score was 68.83. Then the N-Gain value data of the experimental group is greater than the control group with the results of 53.30> 23.01. These results explain the significant increase in scientific article productivity in the experimental group compared to the control group. This finding consistently supports the idea that the use of ChatGPT can increase the productivity of scientific articles for students. The implications of the results for scholarly writing practice are also discussed, along with recommendations for further research.

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Keywords:
artificial intelligence; ChatGPT, postgraduate students; scientific article productivity

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Introduction

Scientific articles play a crucial role for students and higher education institutions. Being an important platform for disseminating new knowledge and research findings, scientific articles provide an opportunity for students to contribute to expanding understanding in a particular field of science (Jayanegara et al., 2023). In addition, writing quality scientific articles can also build students' academic reputation and influence others' perception of their abilities (Listyotami & Reznani, 2022). More than just an academic assignment, writing scientific articles involves a deep learning process, strengthening problem-solving skills and literature analysis (Arifudin, 2023). In the context of higher education institutions, scientific articles are valuable contributions that enrich the literature and strengthen the knowledge base in the field of study (Nisya & Kusmayadi, 2022). In addition, scientific articles also play a role in strengthening the

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image and reputation of higher education institutions and improving the overall quality of education (Sastrawijaya & Aditya, 2020).

However, many graduate students face challenges in improving the productivity and quality of the scientific articles they produce. Students often face various challenges in producing quality scientific articles. Some of the factors that contribute to students' difficulties in producing scientific articles are lack of experience in writing scientific articles, immature writing skills, inadequate understanding of concepts, poor time management, and low motivation and self-confidence (Pardjono et al., 2017). Students new to the world of research may feel overwhelmed by the demands of writing that require a deep understanding of research methodology, relevant literature, and correct writing structure. Poor writing skills, lack of conceptual understanding, and lack of effective time management can also be obstacles in producing quality scientific articles (Gilis & Winarta, 2019). In addition, low motivation and self-confidence can also hinder student productivity and performance in writing scientific articles (Rushendi et al., 2021). With the right support, guidance and resources, students can overcome these difficulties and improve their ability to produce good scientific articles (Putra et al., 2021).

In recent months, ChatGPT has become one of the attention-grabbing technological innovations in the field of artificial intelligence. ChatGPT is a machine learning model that has the ability to generate text that closely resembles human text in various contexts (Helberger & Diakopoulos, 2023). The use of ChatGPT as a tool in writing scientific articles promises to increase the productivity of postgraduate students at IAIN Kediri. The use of ChatGPT as a solution for students in overcoming factors of difficulty in writing scientific articles offers a lot of potential. By using ChatGPT as a tool, students can improve their limited writing experience, enhance their writing skills, understand complex concepts, manage time more effectively, and get a motivational boost (Haleem et al., 2022). ChatGPT can help students produce quality writing, learn the correct writing structure, and learn from good writing examples (Lund & Wang, 2023). However, it is important for students to still understand the concepts underlying their research and ensure that the resulting scientific article remains an original work (van Dis et al., 2023). With judicious use of ChatGPT, students can improve the productivity and quality of their scientific articles, as well as gain a better understanding of the writing process (Baidoo-Anu & Owusu Ansah, 2023).

ChatGPT stands for "Chat Generative Pre-trained Transformer", a language algorithm model developed by OpenAI. It uses the Transformer architecture and has undergone a "pre-training" process in its learning (Muna et al., 2023). The goal of ChatGPT is to generate text that resembles human writing and can interact with users through conversation or chat (Haleem et al., 2022). In a simpler sense, ChatGPT is an artificial intelligence system capable of understanding human language and generating relevant and reasonable response text. To achieve this, the model is trained using a large amount of text data from various sources, which allows the model to learn the grammar, sentence structure, and context of human language (Rossoni & GPT, 2022). As such, ChatGPT can be used to respond to a user's message or question with appropriate text, providing explanation, advice or needed information. In addition, ChatGPT also has the ability to generate creative text, making the responses more natural and diverse (Baidoo-Anu & Owusu Ansah, 2023). However, it is important to remember that ChatGPT also has limitations. The model does not have a deep understanding of context or specific knowledge, and the resulting responses can vary in quality and correctness (Eysenbach, 2023). Overall, ChatGPT can be considered a computational system that uses artificial intelligence to understand and generate text in human language through conversation or chat. With advanced natural language processing capabilities, ChatGPT provides the opportunity to interact with users naturally and provide relevant responses, making it a useful tool in a wide range of human-machine communication and interaction applications.

As a solution in education, ChatGPT can help overcome some of the challenges faced by students. For example, ChatGPT can be a solution for students who face difficulties in understanding the subject matter. With the help of ChatGPT, they can get more detailed explanations and deepen their understanding (Lund & Wang, 2023). In addition, ChatGPT can also assist students in improving their writing skills by providing immediate feedback and assisting in correcting writing errors (Rahman et al., 2023). Overall, ChatGPT is an artificial intelligence tool that can be used in education. Its uses include being a virtual assistant, improving writing skills, and a reference source (Tuhuteru et al., 2023). As a solution in education, ChatGPT can assist students in understanding subject matter, improve writing skills, and provide quick access to wider knowledge (Qadir, 2022). However, keep in mind that the use of ChatGPT in education also has limitations. ChatGPT is a language model that generates text based on data that has been learned, so it does not necessarily always produce correct or contextually appropriate answers. Therefore, the role of educators and human guidance remains important in providing direction and correcting students in the use of ChatGPT (Tlili et al., 2023).

In several studies, ChatGPT has been explored as a tool in writing scientific articles. A study conducted by Edi Supriyadi from Bandung College of Technology and has been published in Papanda 1 Journal shows the results of the exploration of the use of ChatGPT in writing mathematics education articles. The results showed that ChatGPT can be used as a tool in creating math education research articles and the articles produced by ChatGPT are very satisfying (Supriyadi, 2022). In this study, ChatGPT was able to make an abstract, introduction, research objectives, research methods, results and discussion, and conclusions. However, the sample in this study is still lacking because the researcher said there were time and resource constraints.

In addition, experiments written in an article by Adi Setiawan and Ulfah Khairiyah Luthfiyani in Journal UNIMUDA 2 also proposed the use of ChatGPT to improve writing skills in the Education 4.0 era. The experiment produced a writing of 693 words where these results can still be developed further (Setiawan & Luthfiyani, 2023). The total time taken to complete the experiment was approximately 7 minutes, including the time to document the results of the ChatGPT processing by the author, but excluding the time to formulate two good and effective prompts at the beginning. In the experiment, the authors emphasized that formulating good and effective prompts requires critical thinking competence in order to get the desired ChatGPT response. Thus, the authors in this article are of the view that if done in the conventional way without the help of ChatGPT, the time needed for writing would be much longer. This is because it involves a number of competency-building activities, such as critical thinking by thinking about the writing outline first, and reading and understanding a number of references about ChatGPT or AI from the library or from Google search results.

In that context, this study aims to fill the knowledge gap by investigating the effect of using ChatGPT on the scientific article writing productivity of IAIN Kediri graduate students. The study will involve two groups of students, where one group will use ChatGPT as an aid in writing scientific articles, while the control group will not use ChatGPT. Using a quasi-experimental method approach, the study will collect data on the number of scientific articles produced, the quality of the scientific articles, the time spent in writing, and satisfaction with the writing process. It is expected that the results of this study can provide a better understanding of the potential use of ChatGPT in increasing the productivity of IAIN Kediri graduate students in writing scientific articles. The implications of this research are expected to contribute to the development of higher education, especially in terms of the application of artificial intelligence technology in the process of writing scientific articles. In addition, this research is also expected to provide recommendations and practical guidelines for IAIN Kediri graduate students in improving their scientific article writing productivity. Thus, it is hoped that this research can have a positive impact on the development of the academic community and the improvement of the quality of higher education at IAIN Kediri.

Method

This study uses a quantitative approach, because the research data is in the form of numbers and the analysis needs to use statistical formulas. This study includes an experimental group involved in making articles using ChatGPT and a control group using a conventional model. The participants of this study were 2nd semester graduate students of Islamic education management study program at the State Islamic Institute (IAIN) Kediri. The duration of time in this study is 5 months or during 1 semester of lectures, starting from February 20, 2023 to June 29, 2023. Researchers set the distance studied, because the relationship formed is the relationship between the object and the subject, thus will receive a high level of objectivity (Isnawan, 2020). The type of research used is Quasi Experimental. Quasi-experimental is often used in educational research, especially in various variables that are not studied, for example, statistics, regression, maturity. Design nonequivalent control group design, instruments in quantitative research can include questionnaires, observations, and interview guidelines (Rukminingsih et al., 2020). Thus, this study required various instruments that measured the use of ChatGPT, assessed the ability to write scientific articles for students, and measured the level of productivity of scientific articles produced.

After all the required data has been coded, then proceed with data analysis. Furthermore, the instrument reliability test is calculated through the Cronbach Alpha formula, which according to (Isnawan, 2020) a construct is said to be reliable if it provides a Cronbach Alpha value> 0.6. In the reliability test on the question of making scientific articles, the results of the reliability test value using Cronbach Alpha are 0.851, which means that the 10 questions on making scientific articles are reliable. Normality testing was carried out using the Shapiro-Wilk test approach. By using a significant level of 5% where if the P Value> 0.05 means that the variable is normally distributed. Homogeneity test using Lavene Statistic which if P Value ≥ 0.05 means the sample is declared homogeneous.

After the prerequisite test was carried out, the next step was to test the difference in the mean scores of the experimental group using ChatGPT in making scientific articles with the control group using the conventional model. This mean difference test uses the Independent Sample tTest Test with the help of SPSS version 21 for OS Windows. Learners will have a difference in mean scores between the scores of the experimental group and the control group if the P Value <0.05. To determine the use of ChatGPT in making scientific articles on the productivity made by using the N-Gain formula. Gain is the difference between the Post-Test and Pre-Test scores which shows the increase in student scientific article productivity after this experiment is carried out. The calculation of the Gain score is obtained using the formula below:

$$\text{Normalized Gain (g)} = \frac{\text{PostTest Score} - \text{PreTest Score}}{\text{Maximum Score} - \text{PreTest Score}}$$

In the formula, it is explained that g is the normalized Gain score (N-Gain) of both scientific article writing approaches, while the ideal maximum score of the initial test (Pre-Test) and the final test (Post-Test). Productivity in hypothesis testing based on Gain has the criteria that students are declared productive if the average Gain score is at high criteria or at least 0.7. The assessment productivity criteria are seen from the N-Gain with the percentage said to be productive if N-Gain> 50%, and said to be very productive if N-Gain > 75%.

Results

Data on student scientific article productivity before data treatment is obtained from the Pre Test score of scientific article writing ability. Before testing the equality of the two means of the control group and the experimental group, prerequisite testing is

needed which includes the Homogeneity Test and the Normality Test of the two variances of the Pre Test and Post Test scores.

Table 1. T-Test Score

Independent Sample T-Test		
	Average	**P Value**
Making Scientific Articles Experimental Group	82,68	0,00
Scientific Article Writing Control Group	68,83	

Based on the results in table 1, the P Value obtained from the Independent Sample T-Test test is 0.00 which means the sig value <0.05 so that H1 is accepted which means there is a difference between the level of productivity of scientific articles of students who use ChatGPT and those who use conventional models. Analysis to determine how productive the making of scientific articles of students who use ChatGPT with the making of scientific articles conventional model by using the N-Gain test. The results of the N-Gain analysis can be observed below.

Table 2. N-Gain Score

	N-Gain Test		
	Lowest Score	Highest Score	Average N-Gain Score
Experimental Group	13,04	100	53,30
Control Group	5,66	58,82	23,01

Based on table 2 above, the average N-Gain value for the experimental group (using ChatGPT) is 53.30 or 53.30% which is categorized as productive where the maximum N-Gain score is 100% and the minimum is 13.04%. Meanwhile, the average value of N-Gain in the control group (conventional model) is 23.01 or 23.01% which is included in the unproductive category. With a maximum N-gain score of 58.82% and a minimum of 5.66%. So it can be concluded that the productivity of student scientific articles using ChatGPT is more productive than those not using ChatGPT or with conventional models, because it refers to the N-Gain value of the experimental group greater than the N-gain of the control group (53.30> 23.01).

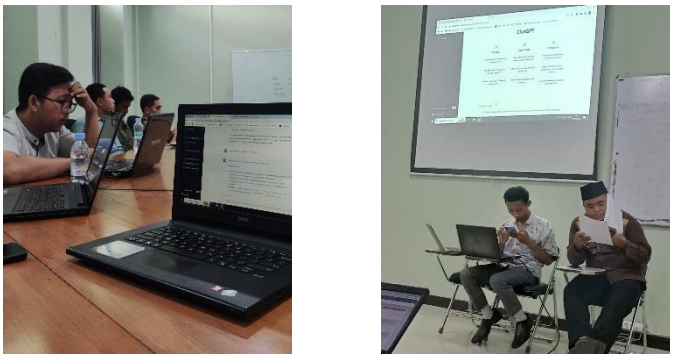
Based on the results of research in the formulation of problems about the difference in making student scientific articles between using ChatGPT and conventional models on their productivity, the results obtained for the average value of the Pre Test in the experimental group which measured the productivity of making scientific articles was 64.75 while the average value of the Post Test in the experimental group increased to 82.68. The average Pre Test in the control group was 60.10 while the average Post Test in the control group only increased by 8.73 so that it became 68.83. It can be seen that on average there was a significant increase in the average value of the Pre Test and Post Test in the experimental group using ChatGPT compared to the average value of the Pre Test and Post Test of the control group using the conventional model in writing scientific articles.

Discussion

Based on the results of this study, there is evidence to support the claim that the use of ChatGPT can increase the productivity of scientific articles for students. For example, an experiment conducted by Zhai found that in creating an article of approximately 5,830 words entitled "Artificial Intelligence for Education". As an expert in artificial intelligence, Zhai found the machine-generated article to be coherent, relatively (partially) accurate, informative and systematic. ChatGPT's ability to provide the information needed is also more efficient than the average human, and its writing ability is above the average student.

It took Zhai only 2-3 hours to produce the article, including minor editing and reorganization (Zhai, 2023b). In addition, the results of this study confirm the article made by Adi Setiawan and Ulfah Khairiyah Luthfiyani in the UNIMUDA Journal where the authors have the view that if you make scientific articles in a conventional way without the help of ChatGPT, of course the time required will be much longer (Setiawan & Luthfiyani, 2023). This is because it involves a number of competency-building activities, such as critical thinking by thinking of a writing outline first, and reading and understanding a number of references on the topic to be researched from the library or from Google search results.

The assertion in the concept is in accordance with the findings of this study, which in the Independent Sample T-Test test is 0.00 which means the sig value <0.05. Thus H1 is accepted which means there is a difference between the productivity of making scientific articles using ChatGPT and those using conventional models. This is because the ChatGPT prototype is a dialog-based artificial intelligence (AI) chatbot that is able to interpret human natural language and produce text that is very detailed and has human-like characteristics (Alkaissi & McFarlane, 2023). ChatGPT is the latest version of GPT-3 (Generative Pretrained Transformer 3), an AI model for advanced language processing developed by the OpenAI foundation. This model gives ChatGPT the ability to generate text that closely resembles that produced by humans (Misnawati, 2023).



(a) (b)

Figure 2. Experimental group intervention in creating scientific articles

The results of this study revealed significant differences in the productivity of students' scientific articles before and after carrying out the experiment. However, when compared between the experimental and control groups based on the data in Table 2, it can be seen that the experimental group that used ChatGPT in making scientific articles achieved better productivity. This shows that when students are involved in the process of making scientific articles using ChatGPT with prompts according to the topic of discussion that they determine themselves, it can increase the productivity of the scientific articles they produce (Figure 2). This finding is consistent with previous research (Zhai, 2023a; Setiawan & Luthfiyani, 2023; Macdonald et al., 2023). In addition to these studies, (Supriyadi, 2022) has also conducted similar research where ChatGPT can be used as a tool in making scientific articles for students, which in the context of the study used the topic of mathematics education. And the scientific articles produced by ChatGPT are very satisfying. Therefore, based on the results of this study and confirmed by several previous studies, it can be concluded that the use of ChatGPT significantly increases the productivity of student scientific articles compared to conventional methods or not using the ChatGPT platform.

Finally, it is important to acknowledge the limitations of this study. The sample size may limit the generalizability of the findings to other college and university student subjects. In addition, the duration and intensity of the intervention process may have influenced the results. These limitations should be considered when interpreting the findings by professional readers or academics. Overall, the results of this study indicate

that the use of ChatGPT has a significant positive impact on the productivity of scientific articles of graduate students at Institut Agama Islam Negeri (IAIN) Kediri. These findings provide real empirical evidence and strongly support the use of ChatGPT to create scientific articles for students.

Conclusion

The use of ChatGPT is proven to be able to increase the productivity of scientific articles for students, which this study has empirically proven through the results of the T-Test. This finding provides valuable insight into the potential use of the ChatGPT platform in creating effective scientific articles. The results showed that the N-Gain Score of the experimental group was greater than the N-Gain Score of the control group (53.30 > 23.01). This indicates a significant increase in scholarly article productivity among students who engaged in scholarly article creation using ChatGPT compared to students who used conventional means. The implications of this study are significant for students, lecturers, and educational practitioners. The findings highlight the need to use the ChatGPT platform as an effective how-to strategy for creating scientific articles for students in higher education. Integrating the concepts of critical, logical and scientific thinking into systematic thinking so as to produce good and correct prompts in order to produce the answers given by ChatGPT are very appropriate to the desired and the results are very satisfying. This research is expected to bridge further research by using ChatGPT as a very effective tool for publishing scientific articles and being able to become the only AI-based chatbot that becomes the main author in publishing scientific articles in international journals. In addition, future research can also compare the results of scientific articles assisted using ChatGPT with other AI-based chatbots without any other variables that might affect.

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