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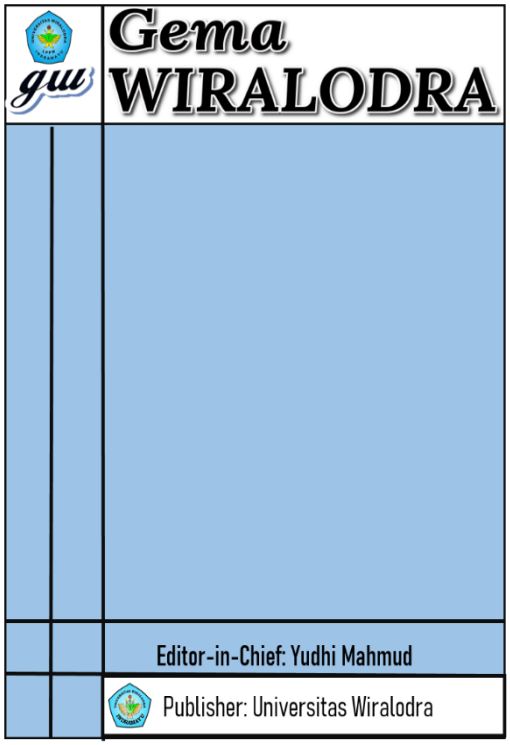

The Effect of Using the ChatGPT Application on Students' Analytical Abilities

Rina Devi Siahaan[a*], Herlina Novita[b] , Rick Hunter Simanungkalit[c], Rince Marpaung[d], Rio Parsaoran Napitupulu[e] Sepriandison Saragih[f]

[a*]Universitas HKBP Nommensen Pematangsiantar, Indonesia, rinasiahaan80@gmail.com
[b]Universitas Prima Indonesia, Indonesia, dhabitaziggy@gmail.com
[c]Universitas HKBP Nommensen Pematangsiantar, Indonesia, rick.simanungkalit@uhnp.ac.id
[d]Universitas HKBP Nommensen, Indonesia, rince@uhn.ac.id
[e]Universitas HKBP Nommensen Pematangsiantar, Indonesia, rio.napitupulu@uhnp.ac.id
[f]Universitas HKBP Nommensen Pematangsiantar, Indonesia, sepriandisonsaragih@gmail.com

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The Effect of Using the ChatGPT Application on Students' Analytical Abilities

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[a*]Universitas HKBP Nommensen Pematangsiantar, Indonesia, rinasiahaan80@gmail.com
[b]Universitas Prima Indonesia, Indonesia, dhabitaziggy@gmail.com
[c]Universitas HKBP Nommensen Pematangsiantar, Indonesia, rick.simanungkalit@uhnp.ac.id
[d]Universitas HKBP Nommensen, Indonesia, rince@uhn.ac.id
[e]Universitas HKBP Nommensen Pematangsiantar, Indonesia, rio.napitupulu@uhnp.ac.id
[f]Universitas HKBP Nommensen Pematangsiantar, Indonesia, sepriandisonsaragih@gmail.com

***Correspondence: rinasiahaan80@gmail.com**

Abstract
The rapid development of artificial intelligence (AI) has significantly influenced various aspects of human life, including the field of education. One of the most widely used AI tools today is ChatGPT, a language model developed by OpenAI. This application can respond to questions, generate essays, explain complex concepts, and assist students in completing academic tasks in a clear and interactive manner.This study aims to examine the effect of using the ChatGPT application on the analytical skills of students at HKBP Nommensen University, Pematangsiantar. ChatGPT is a natural language-based artificial intelligence model that is now starting to be used as a learning companion in various fields of science, including higher education. This study used a quantitative approach with a quasi-experimental method through a pretest-posttest control group design. The sample consisted of 60 students, divided into two groups: experimental and control. The research instrument was a descriptive test of analytical skills that had been validated by experts. The results of data analysis using ANCOVA showed a significant effect of the use of ChatGPT on students' analytical skills ($p < 0.05$). These findings indicate that ChatGPT can contribute positively to the development of students' analytical thinking skills if used appropriately and directed in learning.
Keywords: Chatgpt, Analytical Skills, Students, Artificial Intelligence

1. Introduction
The changing times marked by advances in digital technology have impacted nearly every aspect of life, including education. The Industrial Revolution 4.0 and Society 5.0 present both challenges and opportunities for higher education to adapt technology to the learning process. Digital technology is not only a tool but also an integral part of learning strategies, requiring lecturers and students to be more creative, adaptive, and reflective in accessing and managing information. One rapidly developing technology that is now beginning to be used in academic settings is artificial intelligence (AI). One concrete form of AI that is currently popular and easily accessible to students is ChatGPT, a natural language processing-based language model developed by OpenAI.

ChatGPT is designed to respond to text logically, responsively, and data-drivenly. In an educational context, this application can be used as a virtual learning assistant, where students can ask questions, discuss discussions, request conceptual clarification, and even explore ideas on an issue. This provides a more personalized and interactive learning experience and can encourage students to be more active and independent in understanding course material. On the other hand, the current higher education system also demands the achievement of higher-order thinking skills (HOTS). One form of this skill is analytical skills, namely the ability to break down information into components, recognize the relationships between these parts, and identify the underlying principles (Anderson & Krathwohl, 2001). In the context of Pancasila

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and Citizenship Education (PPKn), analytical skills are a key skill that students must possess. Civics students are expected to not only understand legal theories or norms, but also be able to analyze the dynamics of national and state life, understand socio-political conflicts, and be able to provide solutions or alternative resolutions based on the values of Pancasila and the constitution.

Civics education has unique characteristics: an integration of cognitive, affective, and psychomotor aspects, and contains moral, national, and democratic values. Students must be able to examine current issues, such as corruption, intolerance, human rights violations, the degradation of democracy, and issues of globalization and national identity, through an analytical and critical approach. Unfortunately, many students still tend to be passive and lack the courage to think independently and present logical, data-based arguments. They often rely on textbooks and single authoritative sources and are less accustomed to exploring multiple perspectives. This situation indicates a gap between the expected learning outcomes and the reality of the learning process in the field. Therefore, innovation in learning methods is needed that can encourage students to think critically and analytically. One solution that can be offered is to utilize the ChatGPT application as a learning medium that supports the development of analytical skills. ChatGPT allows students to dialogue with the system in real time, test their logic, develop arguments, and receive instant feedback on their understanding. In addition, ChatGPT can also be used to enrich students' knowledge of current citizenship issues from various sources and perspectives, thereby strengthening their ability to construct logical and critical arguments.

Several previous studies have shown that the use of AI technology in education has a positive impact on students' thinking skills. For example, Susanti et al. (2023) stated that students who used ChatGPT showed improved conceptual understanding and were able to explain arguments coherently. Research by Dwivedi et al. (2023) even confirmed that ChatGPT can be used as an effective reflective learning partner in improving cognitive interaction, conceptual understanding, and problem-solving skills. In the context of civics studies, the use of AI can broaden students' thinking horizons, familiarize them with responsible reasoning processes, and increase sensitivity to democratic values and human rights. However, the use of ChatGPT also requires critical consideration. On the one hand, this application offers convenience and accessibility of information. However, on the other hand, ChatGPT is not a definitive source of knowledge. There is a risk that students will simply copy information without understanding the thought processes behind the resulting answers. Therefore, the use of ChatGPT must be accompanied by digital literacy and guidance from lecturers, so that students can use this technology wisely and critically, without replacing genuine scientific thinking. In particular, ChatGPT can scaffold students' reasoning processes, clarify misconceptions, and promote deeper engagement with learning content, thus fostering their analytical skills (Kasneci et al., 2023).

2. Method

This research is a quantitative study with a quasi-experimental approach, using a pretest-posttest control group design. This design was chosen to determine the effect of using the ChatGPT application on students' analytical skills by comparing the pretest and posttest results between the experimental and control groups. In the experimental group, students were given treatment in the form of integrating the ChatGPT application into learning activities, while the control group followed conventional learning methods without the support of the ChatGPT application. The subjects of this study were fourth-semester students of the Pancasila and Citizenship Education Study Program at a private university in North Sumatra. Subjects were

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selected using a purposive sampling technique with the following criteria: active students currently taking the Analysis of Citizenship Issues course, students who had devices and internet access to use ChatGPT, and students who were willing to participate in the entire research process. The total sample size was 60 students, divided proportionally into two groups: an experimental group of 30 students and a control group of 30 students. The independent variable in this study was the use of the ChatGPT application. The dependent variable was students' analytical skills, which were measured through a citizenship issue-based analysis test. Data were collected through an analytical skills test in the form of an essay designed to measure students' abilities in: identifying issues and facts, analyzing cause-and-effect relationships, constructing logical arguments, and drawing conclusions based on the principles of Pancasila and the constitution. The instrument was first tested through content validation by three experts in the field of Civics education and learning evaluation. Validation results indicate that the instrument has a high level of relevance and content suitability (Aiken's V > 0.85). The instrument's reliability was tested using Cronbach's Alpha formula, with a result of $\alpha = 0.81$, indicating that the instrument is reliable. The research steps were carried out as follows: An analytical ability test was administered to both groups to determine their initial abilities. The experimental group used ChatGPT in discussions and assignments (such as analyzing human rights cases, social conflicts, and the constitution). The control group followed regular learning without ChatGPT. After four sessions (2 weeks) of treatment, the analytical ability test was administered again. Pretest and posttest data were analyzed to determine the effect of ChatGPT use. Data were analyzed using Analysis of Covariance (ANCOVA) to determine the effect of ChatGPT application use on students' analytical abilities after controlling for differences in initial scores (pretest). Before conducting ANCOVA, statistical assumption tests were conducted, including: normality test using Shapiro-Wilk, homogeneity test using Levene's Test, and linearity test for the pretest and posttest relationship. The analysis results were declared significant if the p-value <0.05.

3. Results and Discussion

After four sessions (two weeks) of treatment, a posttest was administered to both groups on their analytical skills. The following are the descriptive results of the pretest and posttest scores for students in each group:

Table 1.
Descriptive Statistics

Group	N	Mean Score	Standard Deviation
Experimental	30	82.47	5.86
Control	30	74.13	6.41

The data show that the mean score of the experimental group was 82.47, which is higher than the control group, which had a mean score of 74.13. This indicates that students who used the ChatGPT application performed better in analytical tasks. It was observed that the experimental group's posttest average significantly increased compared to the control group. To confirm statistical significance, an analysis of covariance (ANCOVA) was conducted, controlling for the influence of pretest scores. The ANCOVA results showed: F-value = 10.732, Significant (p) = 0.002 < 0.05. Thus, there was a significant effect of using the ChatGPT application on improving students' analytical skills. In addition to statistical data, qualitative observations were made from students' interactions with ChatGPT.

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The following are examples of actual student responses during analytical tasks, both before and after using ChatGPT: before using ChatGPT (Control Group – Traditional Method)

Prompt: *Explain the cause of inflation in terms of supply and demand.*
Student response:"Inflation is caused when things become expensive because of many reasons. Sometimes it's because of high prices or people don't have enough money." The student's answer lacks structure and fails to identify specific economic mechanisms (e.g., demand-pull or cost-push inflation). The argument is vague and descriptive rather than analytical.

After using ChatGPT (Experimental Group)

Prompt: *Explain the cause of inflation in terms of supply and demand.*
Student response (with ChatGPT assistance):
"Inflation can be caused by an increase in demand for goods and services without a corresponding increase in supply, which is known as demand-pull inflation. Alternatively, a decrease in supply, such as due to higher production costs, can also drive inflation—this is referred to as cost-push inflation." The response shows improved use of terminology, clearer structure, and the ability to distinguish between types of inflation. It reflects an analytical understanding developed through AI interaction.

While the results demonstrate that ChatGPT improved students' analytical responses, the study also uncovered potential areas of bias or overreliance some students tended to copy responses directly from ChatGPT without sufficient reflection or paraphrasing. For example:

"Inflation happens due to demand-pull or cost-push factors..." (identical to ChatGPT output)

This indicates surface-level learning, where students may not internalize the concept but rely on AI to produce correct-sounding answers. A few students accepted all ChatGPT responses as factual, even when minor inaccuracies were present. They demonstrated limited critical questioning or verification of content. Bias may also arise from technological disparities, as not all students have equal access to stable internet or devices to use ChatGPT effectively.

The results of the study showed that students who used the ChatGPT application in their learning demonstrated greater improvement in analytical skills compared to students who did not. This demonstrates that ChatGPT can function as a supporting medium for critical and analytical thinking in civics learning. Students in the experimental group not only passively read the material but also actively engaged in dialogue with ChatGPT to explore complex issues such as human rights, democracy, intolerance, and constitutional law. These discussions helped students develop arguments, construct logical thought processes, and compare various perspectives, key indicators of analytical skills (Anderson & Krathwohl, 2001). This finding is supported by research by Susanti et al. (2023), which found that students who habitually used ChatGPT were more reflective and systematic in answering analytical questions. ChatGPT also facilitated students in practicing reasoning, improving the structure of their answers, and recognizing errors in thinking through rapid feedback.

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In the context of civics learning, analytical skills are crucial because students must navigate socio-political realities filled with dynamics, conflict, and ambiguity. Through interaction with ChatGPT, students not only receive answers but are also asked to re-explain, critique arguments, and seek alternative references. This process encourages them to rely less on memorization and, instead, prioritize reasoning and a substantive understanding of the values of Pancasila and the constitution. However, the effectiveness of ChatGPT depends heavily on how it is used. If it is simply used to copy answers or complete assignments mindlessly, students will not benefit from strengthening analytical skills. Therefore, the role of lecturers is crucial in guiding and facilitating the ethical and educational use of ChatGPT, such as through guided assignments, open discussions, and critical reflection. These findings have important implications for developing learning strategies in the digital age, particularly in civics education. The integration of technology like ChatGPT not only supports learning efficiency but can also improve the quality of students' thinking skills if used in a planned manner and based on learning objectives.

4. Conclusion

This study shows that the use of the ChatGPT application in the learning process significantly improved the analytical skills of students in the Pancasila and Citizenship Education Study Program. Students who used ChatGPT demonstrated greater improvement in their ability to identify issues, construct logical arguments, evaluate information, and draw conclusions based on civic principles. The ChatGPT application has proven to be an effective learning tool in facilitating higher-order thinking processes, particularly in the analysis of national, social, and constitutional issues.

The use of ChatGPT encourages students to be more independent in their learning, accustomed to exploring ideas, and developing reflective thinking habits. Therefore, the integration of artificial intelligence technology in Civics learning has significant potential to strengthen 21st-century learning outcomes, particularly in the areas of digital literacy and critical-analytical thinking.

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