Journal of Applied Informatics for Sustainability and Artificial Intelligence
AISAI Journal
https://jurnal.polbeng.ac.id/index.php/AISAI

Volume 1 Issue 1 Year 2026 | Page 1-11 | e-ISSN: xxxx-xxxx | ISSN: xxxx-xxxx
Received: 18-01-2026 | Revised: 27-01-2026 | Accepted: 10-02-2026

The Impact of Moderating ChatGPT Usage on Problem-Solving Skills among Computer Science Students

Nadhifa Fairuz Salsabila[1], Elsa Dewi Rahmalia Sari[2], Intan Dwi Safrida[3], Melati Mahardika[4], Nur Hayatin[5]
[1,2,3,4,5] Universitas Muhammadiyah Malang, Kota Malang, Indonesia, 65145
E-mail: : *nadhifasalsabila@webmail.umm.ac.id[1], elsaa@webmail.umm.ac.id[2], intandwis26web-mail@webmail.umm.ac.id[3], melatii@webmail.umm.ac.id[4], noorhayatin@umm.ac.id[5]*
*Correspondence: *nadhifasalsabila@webmail.umm.ac.id*

Abstract: *The rapid development of Artificial Intelligence (AI) in higher education has encouraged the adoption of various digital technologies as learning support tools, including ChatGPT. In Computer Science programs, students are frequently confronted with complex academic problems, making technological support valuable for enhancing their problem-solving skills. This study aims to analyze the effect of ChatGPT usage on students' problem-solving ability and to examine the role of usage frequency as a moderating variable. This research employs a quantitative approach involving 59 Computer Science students from Universitas Muhammadiyah Malang. The data were analyzed using validity testing, reliability testing, correlation analysis, and regression analysis. The results indicate that ChatGPT usage has a highly significant effect on students' problem-solving skills. In addition, usage frequency was found to strengthen the relationship between ChatGPT usage and problem-solving ability. The study concludes that ChatGPT can serve as an effective learning support tool when used in a guided and responsible manner within the higher education learning process.*

Keywords: *ChatGPT, artificial intelligence, problem-solving, students, Computer Science*.

1. Introduction

The development of Artificial Intelligence (AI) in education in Indonesia has grown rapidly, particularly in higher education learning processes[1]. AI is increasingly used as a learning support tool that helps students understand course concepts, complete academic assignments, and improve learning efficiency. One AI application frequently used by students is ChatGPT, which functions as a text-based system that provides explanations and solutions for various academic problems[2].

In Computer Science programs, students face relatively complex challenges, such as understanding algorithms, programming, and debugging code[3]. In this context, ChatGPT can provide quick and structured access to problem-solving support, helping students comprehend the steps required to solve a given problem. Nevertheless, several studies have raised concerns about excessive ChatGPT use, particularly regarding its potential impact on critical thinking and students' dependency on AI[4].

Most previous studies have discussed the use of ChatGPT from conceptual perspectives, literature reviews, or qualitative approaches, and have tended to emphasize the general impact of AI on learning. However, there is still limited empirical research that quantitatively measures the effect

of ChatGPT usage on students' problem-solving skills, especially by considering usage frequency as a strengthening factor. This condition indicates a research gap that warrants further investigation[5].

Therefore, this study aims to analyze the effect of ChatGPT usage on the problem-solving ability of Computer Science students and to examine the moderating role of usage frequency. This research adopts a quantitative approach involving 59 Computer Science students at Universitas Muhammadiyah Malang. The findings are expected to contribute to a better understanding of ChatGPT as an effective and responsible learning support tool in higher education.

2. Research Methods

This study was conducted through several systematically arranged stages to ensure that the data collection and analysis processes were carried out accurately[6]. The research workflow begins with problem identification and ends with conclusion drawing. Visually, the research stages are presented in Figure 1.

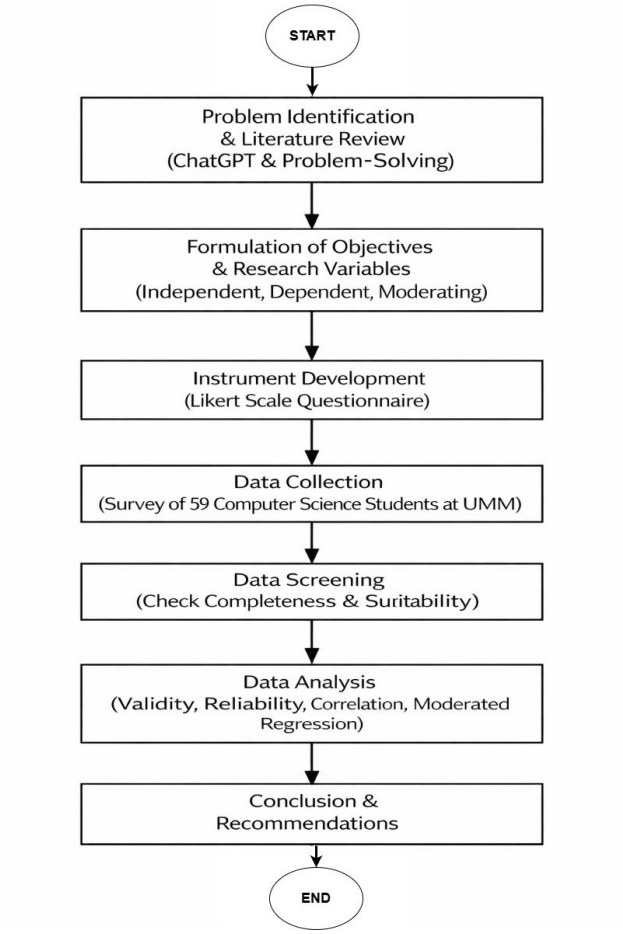

Figure 1. Research Flow

2.1 Problem Identification and Literature Review

The first stage involves identifying the research problem by examining the increasing use of ChatGPT among Computer Science students and its potential impact on problem-solving skills. An initial literature review was conducted to identify existing findings and determine the research gap[7].

2.2 Problem Formulation and Variable Definition

In the second stage, the research objectives and variables were defined. ChatGPT usage was established as the independent variable, problem-solving ability as the dependent variable, and usage frequency as the moderating variable[8]. A research instrument in the form of a questionnaire was then designed to measure both ChatGPT usage intensity and students' perceptions of their problem-solving abilities. The research variables are defined as follows:

1. Independent Variable (X): ChatGPT usage
2. Dependent Variable (Y): Problem-solving ability
3. Moderating Variable (Z): Frequency or intensity of usage this stage ensures a focused research direction for measuring the impact of technology usage[9].

2.3 Instrument Development and Research Data

The study uses primary data collected directly from respondents. The research instrument is a closed-ended questionnaire designed using **a** five-point Likert scale (1–5) to measure students' perspectives. The questionnaire assesses ChatGPT usage intensity and indicators of technical problem-solving skills.

2.4 Data Collection

Data collection was conducted by distributing the questionnaire to 59 Computer Science students at Universitas Muhammadiyah Malang. The collected responses were then screened to ensure completeness and suitability for analysis.

2.5 Data Analysis

After data collection, statistical analyses were performed, including validity testing**,** reliability testing**,** correlation analysis, and regression analysis. These analyses were used to examine the effect of ChatGPT usage on problem-solving ability and to evaluate the role of usage frequency as a moderating variable. The final stage involved drawing conclusions by interpreting the statistical results and providing recommendations regarding the responsible use of ChatGPT in Computer Science education.

3. Results and Discussion

Based on the average-score chart of ChatGPT usage indicators, all indicators show mean values above 3.50, indicating that overall ChatGPT utilization among Computer Science students falls into the high category can show in the Figure 2.

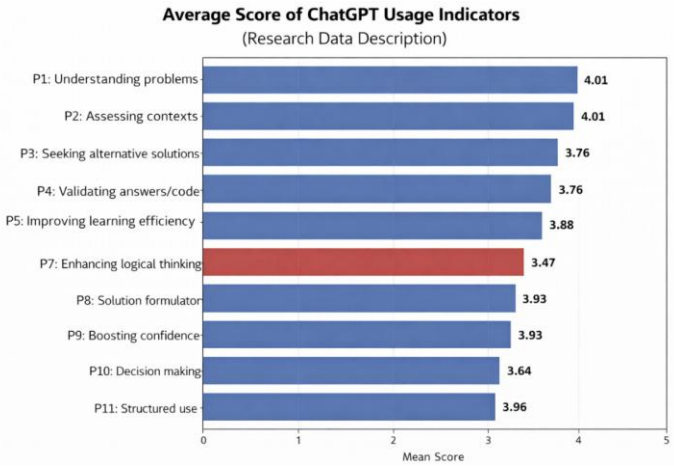

Figure 2. Indicator

Indicator P13 obtained the highest score and reflects a positive contribution to problem-solving. This suggests that students perceive ChatGPT as beneficial in supporting their overall problem-solving performance, particularly in analyzing problems and identifying solutions more effectively. Indicators P1 and P2 also achieved high scores, implying that ChatGPT plays an important role in the early stages of problem-solving by helping students understand the problem context and conduct initial analysis before determining a solution.

Indicators P9 and P10 received the same score, indicating that ChatGPT may enhance students' confidence and support more logical decision-making when solving academic problems. Meanwhile, P7 recorded the lowest score; however, it remained relatively high, suggesting that ChatGPT does not fully replace students' logical thinking, but rather serves as a supportive tool. Indicators P3 and P4 suggest that ChatGPT is fairly effective as an exploratory tool for seeking alternative solutions and checking students' work.

3.1 Analysis of Research Results

Overall, the chart indicates that ChatGPT is used more as a learning support tool than as a means to obtain instant answers. Students remain actively engaged in learning, while ChatGPT is used to strengthen understanding, improve learning efficiency, and verify solutions. This finding aligns with previous studies suggesting that guided and responsible use of ChatGPT can positively affect students' problem-solving performance can show in the Figure 3.

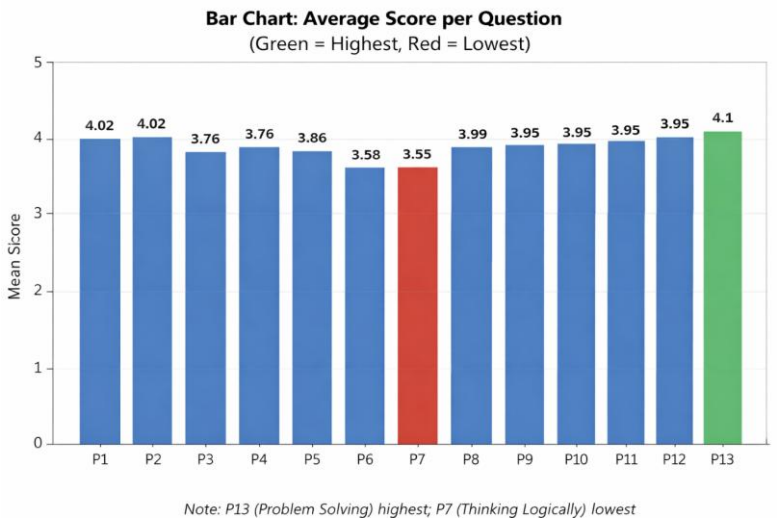

Figure 3. Score per Question

In addition, the high scores on problem-solving impact indicators suggest that higher usage frequency may further strengthen the positive effect. The statistical results also confirm a positive and significant effect of ChatGPT usage on students' problem-solving ability:

1. Linear Regression Equation

The regression model is:

$$Y = a + bX \quad (1)$$

Based on the analysis, the constant value is a = 2.220 and the regression coefficient is b = 0.651, resulting in:

$$Y = 2.220 + 0.651X \quad (2)$$

This indicates that each increase in ChatGPT usage corresponds to an increase of 0.651 units in students' problem-solving ability[10].

2 Coefficient of Determination

The analysis shows $R = 0.769$ and $R^2 = 0.591$, meaning that 59.1% of the variance in students' problem-solving ability can be explained by ChatGPT usage, while the remaining 40.9% is influenced by other factors not included in this study.

3. t-Test

The t-test result shows $t = 9.001$ with $p < 0.005$, indicating that ChatGPT usage has a statistically significant effect on students' problem-solving ability.

4. F-Test

The regression model is significant with $p < 0.005$, indicating that the model is appropriate for explaining the relationship between ChatGPT usage and problem-solving ability. The analysis reports $F = 81.014$.

3.2 Discussion

The findings demonstrate that ChatGPT usage has a significant influence on the problem-solving ability of Computer Science students. Students do not use ChatGPT merely to obtain instant answers; instead, it is used to support understanding of problem-solving steps, analyze problems, and verify programming code. Such use can improve learning efficiency and facilitate comprehension of technically complex material[11].

This study also indicates that higher frequency of ChatGPT usage is associated with greater improvement in problem-solving ability. Students become more confident in facing problems, analyzing them, formulating solutions, and making logical decisions. This provides a different perspective from studies emphasizing the risks of dependency and reduced critical thinking due to excessive AI use. In this study, usage frequency functions as a moderating factor that strengthens the positive impact of ChatGPT when used in a guided and responsible manner[12].

Therefore, the results support the view that ChatGPT does not necessarily reduce students' thinking ability. When used as a learning aid, ChatGPT can contribute positively to students' problem-solving development, particularly in Computer Science programs that require strong analytical and problem-solving capabilities.

4. Conclusions

This study concludes that ChatGPT usage has a significant positive effect on improving the problem-solving ability of Computer Science students. ChatGPT is not only used to obtain instant answers but also as a learning support tool to understand problem-solving procedures, particularly for technical and complex topics. The findings also show that usage frequency acts as a moderating variable that strengthens the relationship between ChatGPT usage and students' problem-solving ability. Students who use ChatGPT consistently and purposefully tend to demonstrate better analytical and problem-solving performance than those who use it infrequently.

Overall, the study confirms that ChatGPT can have a positive impact on students' thinking processes and problem-solving performance when used responsibly. These findings may serve as a basis for educators and higher education institutions to integrate AI technologies as learning tools that support students' analytical development. Students are encouraged to use ChatGPT responsibly and purposefully as a learning aid particularly to understand concepts and solution steps rather than as a substitute for independent thinking. Future studies are recommended to involve a larger and more diverse sample and include additional variables to produce more comprehensive results.

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