# Profiles of Physics Education Students at UNIMED in Using ChatGPT Viewed from Their Critical Thinking Skills

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**Abstract.** This study aims to examine the profile of students in the Physics Education Study Program at UNIMED in using ChatGPT for completing academic assignments. The research employed a quantitative method with a descriptive correlational design. Data were collected through structured questionnaires and critical thinking skill tests, involving a sample of 194 active students during the even semester of the 2024/2025 academic year. The results show that the students' average critical thinking score falls into the low category, with a mean score of 40.77, ranging from 11.5 to 67.7. Analysis of ChatGPT usage profiles reveals that more than 90% of students demonstrated a high level of plagiarism, often copying answers directly without engaging in analysis or evaluation. These findings indicate that ChatGPT is predominantly used as an instant answer tool rather than as a learning aid that fosters critical thinking.

**Keywords:** Student Profile, Critical Thinking Skills, ChatGPT Usage

## 1 Introduction

The development of Artificial Intelligence (AI) has brought changes and impacts in the education sector. In education, AI can carry out various aspects of activities identical to human intelligence such as decision-making, reasoning and learning processes, including in physics learning [1] . The integration of AI in education has introduced new ways of teaching in the learning process. AI is able to produce an AI-based guidance system that adapts learning content and is able to provide personalized guidance that has an impact on increasing motivation,

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participation and academics [2, 3] . One of the AIs that is familiarly used by various groups today is ChatGPT.

ChatGPT (Generative Pre-trained Transformer) is an artificial intelligence-based technology developed to mimic human interaction with natural language processing *(* NLP ) [4] . ChatGPT is also a form of *Large Language Model* that is trained through a collection of texts to recognize patterns of relationships between words so that the system can predict the next word and provide a response that looks natural like human conversation [5] . ChatGPT is not only able to respond to questions, but can also be in the form of text such as articles, essays, codes, to emails that allow users to give commands to obtain output in the form of text, images, or videos that are generated automatically [6] . ChatGPT's ability to produce answers to various student assignments, complete difficult work, answer complex and complicated questions and its ability to string together ideas is what makes the use of Chat GPT increase in various groups [7 , 8 , 9] . Currently, ChatGPT plays an important role in facilitating student learning, such as providing answers to questions, explaining difficult concepts to be simpler and easier to understand, even providing fast and appropriate feedback according to learning needs [10] . ChatGPT brings a new paradigm in education with its ability to process data quickly and accurately, provide alternative solutions, and increase the breadth and depth of various tasks including in physics learning [11, 12] . The difficulty of learning physics for some or the majority of people opens up opportunities for the use of ChatGPT to solve complex and challenging physics problems such as those on waves and others [13] . In physics learning, ChatGPT is able to foster an experimental and inquiry mindset and strengthen the application of inquiry-based learning that enables personalized teaching strategies, so that students can be more adaptive in understanding abstract physics concepts [14, 15] . In addition, research [16] states that in physics learning ChatGPT can produce coherent and numerically accurate answers, but is still weak in providing explanations regarding physical assumptions or validation steps, for example regarding counter-gravity forces or important completion stages. This means that although ChatGPT functions effectively as a learning support in the procedural aspect, the involvement of human supervision is still important to consider so that students' scientific understanding can develop more comprehensively. It is acknowledged that ChatGPT has advantages in assisting the learning process, but its use also presents serious challenges and issues related to ethics. Data security, potential bias, and easy access to instant answers, including for exam questions and answers, have the potential to hinder the development of critical thinking skills [17, 18] .

In physics learning, critical thinking skills are essential for every student, especially in understanding and applying physics concepts . Critical thinking is a process of rationalizing, analyzing, evaluating, and interpreting information related to a logical and sequential scientific discipline in making judgments or decisions conveyed [19] . In physics, this ability is very important because the discipline of physics does require and demand mastery of analysis, data processing skills, and the application of structured logic [20] . In relation to the use of ChatGPT, research [10] explains that ChatGPT functions as a predictor of higher-order thinking skills (HOTS) in inquiry-based learning.

Previous research has indeed discussed the benefits of using ChatGPT in education, but most of these studies are still limited to examining the potential use of AI in general and how students perceive its use. However, research on the impact of ChatGPT use on cognitive abilities such as critical thinking is still very rare and limited [21] . These results are in line with a study [18] that confirms the ethical and academic consequences, including the potential for plagiarism and decreased critical thinking skills due to the use of instant answers from ChatGPT. Research by

[22] also shows that students who rely on ChatGPT tend to have high levels of plagiarism.

Based on the problems described and the complexity of ChatGPT usage in the learning process, it is important to conduct this research to map the profile of UNIMED Physics Education students in using ChatGPT and review its relationship with critical thinking skills. It is hoped that this research can contribute as insight into ChatGPT usage patterns, the benefits and challenges experienced by students, and the potential use of ChatGPT in developing critical thinking skills if used wisely and appropriately and become a foundation for educators and institutions to design AI-based learning strategies that are more ethical, effective, and support the development of 21st-century skills.

## 2 Methods

This type of research is quantitative descriptive, which aims to describe the profile of ChatGPT usage of UNIMED Physics Education students in using ChatGPT and review its relationship with critical thinking skills in physics learning while testing the relationship between the two that can be measured quantitatively. This study uses a correlational descriptive design, which aims to describe each variable while testing the relationship between students' critical thinking skills and ChatGPT usage.

The study population was all active students of the Physics Education Study Program at UNIMED in the 2024/2025 Academic Year, with a sample of 194 students of the Physics Education Study Program, FMIPA UNIMED, determined by purposive sampling technique with the criteria of active students who have used ChatGPT in completing lecture assignments. The research instruments used were the critical thinking ability instrument and the ChatGPT usage experience instrument. Thinking ability was measured using 5 essay questions on the topic of temperature. In this instrument, students were required not only to provide short answers but also to explain the reasons and arguments underlying their thinking. Meanwhile, to measure the experience of using ChatGPT, a questionnaire was used containing a number of statements to measure the frequency and purpose of using ChatGPT, students' perceptions of its usefulness and ease of use, challenges faced, and the perceived benefits of ChatGPT in physics learning. The collected data were analyzed using descriptive and inferential statistics. Descriptive statistics were used to describe the characteristics of the critical thinking ability variables and the use of ChatGPT in the form of mean values, standard deviations, frequencies, and percentages. Meanwhile, inferential statistics used the Pearson Product-Moment correlation test to test the hypothesis regarding the relationship between critical thinking skills (X) and ChatGPT usage (Y). The following is a detailed description of the research procedure:

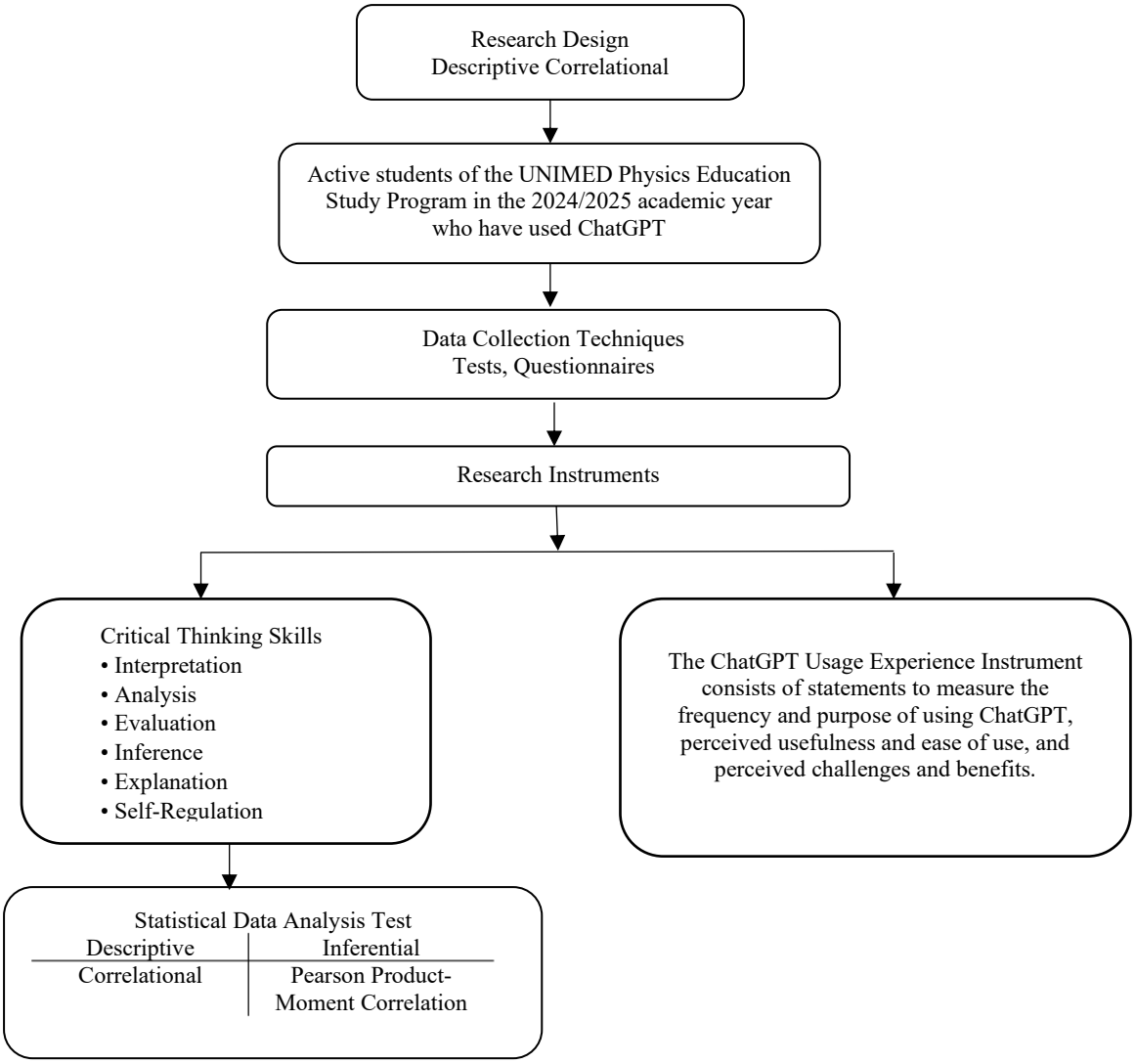


**Figure 1.** Research Procedure

## 3. Results and Discussion

### 3.1 Profile of ChatGPT Student Usage in Physics Learning

Table 1. Student responses to the use of ChatGPT in physics learning

| Statement | Answer (%) (n=194 Students) | | | |
|---|---|---|---|---|
| | Strongly Disagree | Don't agree | Agree | Strongly agree |
| Did you know, Artificial Intelligence (AI) based technology | 0% | 1% | 66.4% | 34.5% |
| You know the ChatGPT platform | 0.5% | 0.5% | 67.5% | 31.4% |
| Physics is a complex subject | 0% | 3.1% | 55.7% | 41.2% |
| ChatGPT is a media that makes it easier for students to gain new knowledge directly. | 0% | 9.8% | 70.6% | 19.6% |
| I can directly copy the answers that appear in ChatGPT as answers when doing homework or exams. | 5.7% | 51.5% | 40.2% | 2.6% |
| ChatGPT helped me to organize problem solving steps in several physics cases. | 0% | 7.2% | 80.4% | 12.4% |
| The ease of accessing physics learning information via ChatGPT makes me more active in following the lessons. | 1% | 13.9% | 77.3% | 7.7% |
| I feel my knowledge is sufficient because there is ChatGPT help | 20.1% | 57.7% | 20.6% | 1.5% |
| ChatGPT can help me in making oral and written reports about my activities by providing direction, suggestions, and even producing content especially in physics subjects so that I don't fall behind. | 0.5% | 20.1% | 70.6% | 8.8% |
| I can learn more deeply about the physics material presented with the help of ChatGPT | 2.6% | 29.9% | 60.8% | 6.7% |
| ChatGPT helps me provide physics example problems to practice my skills. | 0% | 9.3% | 79.9% | 10.8% |
| I can bring the case study I got from ChatGPT about physics learning to study in more depth. | 1% | 20.1% | 74.2% | 4.6% |
| ChatGPT makes me lazy to do routine activities like studying because I can type quickly in ChatGPT | 10.8% | 52.6% | 29.9% | 6.7% |
| I feel NOT interested in ChatGPT assisted learning, especially in physics learning. | 5.2% | 75.8% | 16.5% | 2.6% |
| Using ChatGPT made me understand the concept of AI-based technology. | 4.6% | 47.4% | 42.8% | 5.2% |
| ChatGPT is Competent in providing the information and guidance I need. | 0.5% | 41.2% | 55.2% | 3.1% |
| ChatGPT is reliable in providing accurate and relevant information to users. | 2.1% | 53.6% | 41.2% | 3.1% |
| I am very satisfied with the accuracy of the answers provided by ChatGPT | 2.1% | 54.6% | 40.7% | 2.6% |
| I am very satisfied with the speed of ChatGPT in answering the questions I asked. | 0% | 30.9% | 62.4% | 6.7% |

| Statement | Answer (%) (n=194 Students) | | | |
|---|---|---|---|---|
| | Strongly Disagree | Don't agree | Agree | Strongly agree |
| I use ChatGPT often | 1% | 21.6% | 70.1% | 7.2% |

Based on the results of a descriptive analysis of 194 UNIMED physics education students in the use of ChatGPT in physics learning through a questionnaire response provided in Table 1, it shows that almost 100% of students have known and used ChatGPT technology. The complexity of learning physics for some physics education students opens up great opportunities for ChatGPT as a tool that makes it easier to understand the material, and solve various problems in physics learning. As many as 77% of students feel that ChatGPT is useful in providing easy access to information, deepening learning materials, providing examples of physics problems that can be used as case studies for further study. However, on the other hand, students also consider that the use of ChatGPT is not sufficient to construct their knowledge, which means that the majority of students do not rely entirely on ChatGPT and still need other learning resources. The majority of students consider ChatGPT competent and reliable in the process of finding information or content needed in the physics learning process. As many as 70% of students are also satisfied with the answers given and the speed of ChatGPT in answering questions. Apart from providing positive impacts, the tendency for students to use ChatGPT has a negative impact in the form of dependency which causes some students (30%) to become lazy and only rely on ChatGPT in the learning process.

The distribution of student responses in the table above shows that the majority of students have a positive attitude toward using ChatGPT in physics learning. They believe ChatGPT helps them gain new knowledge, develop problem-solving steps, and provide relevant example questions. While providing opportunities, the use of ChatGPT poses challenges and concerns, including a decline in student learning independence or a tendency to copy ChatGPT answers directly without in-depth thought.

Therefore, to obtain more in-depth information regarding the ChatGPT usage profile among physics education students at UNIMED, this study utilized open-ended interviews. These interviews were conducted to obtain in-depth explanations regarding how students use ChatGPT, their reasons for using it, their experiences, challenges during use, and their expectations for ChatGPT for future physics learning. The interview results are presented in Table 2 below:

Table 2. Interview Results

| No | Question | Student Responses |
|---|---|---|
| 1 | Do you use ChatGPT to complete your college assignments? | Yes, it's true. Some students use ChatGPT to complete coursework, both regularly and occasionally. Some also said they use it only when the assignment is too difficult. Others said they rarely use it. |
| 2 | What are the main reasons for choosing ChatGPT as a learning tool? | The main reasons students chose ChatGPT as a learning tool were because of its fast access, easy-to-understand explanations, simplification of language, ability to paraphrase and summarize, and help understand difficult concepts. |
| 3 | How would you describe your experience using ChatGPT? Does it help you complete tasks, such as completing 6 tasks? | Most found it very helpful, especially in developing frameworks, understanding theory, or writing reports. However, some noted that ChatGPT was merely a support tool, not the primary solution to a task. |
| 4 | How can the description of the experience of using ChatGPT help solve complex physics problems? | Students generally found ChatGPT helpful in explaining basic concepts and providing step-by-step solutions, but it wasn't always accurate for mathematical calculations or complex numerical problems. ChatGPT can provide |

| | | |
|---|---|---|
| | | concrete illustrations and examples of abstract physics concepts. |
| 5 | How would you describe your initial experience in using ChatGPT to complete physics assignments or other assignments, what material assignments were involved? | Many people say they started using it when they were having difficulty understanding topics like Newton's Laws, quantum physics, or school management. ChatGPT is used for paraphrasing, compiling reports, or brainstorming solutions. |
| 6 | Can ChatGPT help you solve complex physics problems, describe the answer? | Most answered yes, but with limitations. ChatGPT was able to explain concepts and steps, but needed further verification. Some found it unhelpful, especially because it didn't handle numerical or context-specific questions well. |
| 7 | Have you encountered any limitations or challenges when using ChatGPT to complete tasks? How did you overcome them? | The answer is yes, but limitations include general answers, inaccuracies, out of context, or failure to cite sources. Solutions include checking with books/journals, formulating more specific questions, or asking a lecturer. |
| 8 | Do you believe ChatGPT can replace teachers or lecturers in learning? Describe your answer! | Almost everyone answered "no." The reason: ChatGPT cannot provide direct interaction, understanding of student situations, motivation, or character and ethics education. ChatGPT is simply a tool for online learning. |
| 9 | What are your hopes for the future development of technology, especially chattGPT in learning? | Students hope that ChatGPT will become a more contextual, accurate, curriculum-integrated learning tool that supports personal and professional learning, but will not replace human educators. |

Based on the interview results, it was found that the majority of UNIMED physics education has used ChatGPT in completing college assignments, although its use varies by student. Some students always use ChatGPT, others only use it when they have difficulties, and still others rarely use ChatGPT. The reasons why students choose ChatGPT are because it is easy to access, its explanations are simple, it can simplify language, paraphrase, summarize, and explain concepts that students find difficult. This statement is in line with research [23, 24] which says that ChatGPT functions as an assistant to students' knowledge in designing questions and even understanding concepts.

Students find it helpful, especially when developing assignment frameworks, understanding theories, and designing reports. However, ChatGPT is considered more of a supporting tool, not a complete assignment. In physics learning, ChatGPT is considered quite effective in explaining basic concepts, providing solution steps, and even creating illustrations that facilitate understanding of abstract concepts. However, ChatGPT's accuracy and precision are still lacking and limited, especially for calculation problems or complex numerical problems. The majority of students initially used ChatGPT when facing difficulties with certain materials, such as Newton's Laws, quantum physics [16] . However, over time, ChatGPT was often used for paraphrasing purposes, compiling reports, or finding initial ideas before solving problems. Furthermore, students realized ChatGPT's shortcomings, such as answers that were too general, not appropriate to the context being discussed, inaccurate, and lacked reference sources. To overcome this, students usually checked back in books or journals, or discussed with lecturers. Although helpful, almost all students emphasized that ChatGPT cannot replace the role of lecturers, because ChatGPT does not have the ability to interact directly, understand emotional conditions, provide motivation, or instill values and ethics. This finding is in line with the research results from [25] , although ChatGPT helps in understanding the material, conceptual errors and even numerical writing in physics are still common, so verification of the results provided by ChatGPT is needed. In addition, [26] , states that critical thinking skills will increase if there is a wise integration of ChatGPT in learning accompanied by lecturer guidance. This means that ChatGPT is only positioned as a learning support, not a substitute for educators.

Students hope that ChatGPT in the future can develop to be more contextual, accurate, in accordance with the curriculum and support personal and professional learning, but its position is as a learning aid or supplement, not a substitute for the role of lecturers or teachers in education.

### 3.2 Review of Students' Critical Thinking Skills regarding the use of ChatGPT

Table 3. Students' critical thinking skills as viewed from the use of ChatGPT

| Variables | Mark | | |
|---|---|---|---|
| | Average | Minimum | Maximum |
| Critical Thinking Skills | 40.77 | 11.5 | 67.7 |
| ChatGPT Usage | 72 | 50 | 100 |

Based on the analysis of the instrument questions designed according to the indicators of critical thinking skills in physics learning on the topic of temperature and heat, the average score of students' critical thinking skills was 40.77, which is in the low category. Furthermore, based on the analysis of student answers, similarities were found between the answers given and the answers generated by ChatGPT. There were 90% (176 students) of the 194 students who provided answers had a level of similarity or plagiarism above 50%-100%. This data shows that students still tend to use ChatGPT as a tool to get answers instantly without cross-checking the answers or information generated by ChatGPT. The use of ChatGPT by students in the process of completing the assigned tasks is still merely to complete the task quickly without a deep thought process. The high similarity of answers in this case shows that students directly copy the answers provided by ChatGPT without first analyzing, evaluating, and elaborating the content provided. This condition is in line with the findings [22] " Plagiarism in the Age of AI: Exploring the Role of ChatGPT in Student Writing and Academic Integrity" which confirms that students who are accustomed to using ChatGPT tend to have higher levels of plagiarism, the difference of which is dominantly visible statistically. This high level of similarity in answers is also caused by a lack of awareness of the importance of academic integrity by students. As according to research [27] , someone who uses ChatGPT with the aim of completing assignments or developing material without being aware of cross-checking will potentially have a high level of plagiarism. Conversely, someone who has an awareness of academic integrity will reduce the level of plagiarism. Research from the MIT Media Lab also explains that the use of ChatGPT has the potential to cause lower brain activity in executive control, memory, and creativity when writing SAT-style essays, compared to those who write essays independently. Therefore, it can be said that the direct use of ChatGPT will weaken students' critical thinking processes. Students who use ChatGPT will experience a decrease in brain performance connectivity when they are switched to writing essays in conditions without aids such as ChatGPT, and will have difficulty remembering essays that they wrote themselves [28] .

In addition, through analysis of the answers given, the results of students' critical thinking abilities were also obtained based on each indicator of critical thinking abilities which are presented in table 4 below.

Table 4. KBK scores for each indicator

| KBK Indicator | Score |
|---|---|
| Interpretation | 0.22 |
| Analysis | 0.68 |
| Evaluation | 0.64 |
| Inference | 0.66 |

| | |
|---|---|
| Explanation | 0.77 |
| Self-regulation | 0.33 |

Table 4 shows the distribution of student abilities based on each critical thinking indicator. Data from the six critical thinking indicators found that students were still weak in the process of interpretation and self-regulation. The low scores for interpretation and self-regulation, which were 0.22 and 0.33 respectively, showed that students were not yet able to understand and write down what they understood from the problems presented in the problem. More than 70% of students immediately wrote answers without first writing down the initial information or problems to be solved. The low results on the interpretation indicator are thought to be caused by students only focusing on solving the problem quickly and getting a grade, which ultimately made them accustomed to providing instant answers without first understanding the meaning of the problem. This condition indicates that students' attention is more dominant on the quick final result compared to the process of critical thinking and comprehensive understanding. They tend to provide spontaneous answers rather than explaining them through coherent stages of thinking . In addition, the low self-regulation indicator in this case is related to student attitudes that influence other indicators. Good self-regulation will play an important role when someone is working on a complex task [29] . In research [30] , low *self-regulated learning* impacts students' weak mastery of critical thinking skills, especially in the aspects of interpretation and analysis. When students do not have good self-regulation skills such as planning, monitoring, or evaluating their understanding, they will often skip important stages in thinking such as interpretation, and only focus on quick answers. External motivations, such as an orientation to get high grades or simply completing assignments quickly, make them less involved in deep thinking processes. This encourages students to more often use shallow learning strategies by directly copying the answers given by ChatGPT rather than understanding them in depth. Academic pressure and an orientation towards achieving grades will also weaken their metacognitive and critical thinking abilities.

In the analysis indicator, students obtained a high score of 0.68. In this process, analysis is the process of recognizing the relationship between questions and concepts in the problem, which is applied through the ability to create accurate physics models and provide appropriate explanations. Data shows that analysis achievement is higher than interpretation. Students tend to be accustomed to pursuing the final answer that is considered correct with analytical procedures, so they often skip the important stage of reading the problem carefully (interpretation). When students find core information, they will immediately conduct analysis. The habit of working on analysis-based problems, such as comparing concepts, determining cause-and-effect relationships, or choosing a solution strategy, makes the analysis indicator feel easier than interpretation, which requires the ability to reformulate information explicitly [31] .

From the critical thinking profile above, it can be seen that the three indicators with the highest scores are Evaluation (0.64), Inference (0.66), and Explanation (0.77). This means that students are better able to assess the quality of arguments, conclude information logically, and deliver clear and coherent explanations. The high scores in these three aspects are inseparable from the learning patterns that students often experience, such as presentations and making reports. This is also emphasized by [32] , who stated that evaluation and explanation exercises, coupled with product-based assessments such as essays, presentations, or reports, can hone students' critical thinking skills, especially in evaluation and explanation.

Based on the statistical correlation test on critical thinking skills with the use of ChatGPT, a positive relationship was obtained as in table 5.

Table 5. Correlation between Critical Thinking Skills and ChatGPT Usage

| | | Critical thinking | ChatGPT Usage |
|---|---|---|---|
| Critical thinking | Pearson Correlation | 1 | .145* |
| | Sig. (2-tailed) | | .043 |
| | N | 194 | 194 |
| ChatGPT Usage | Pearson Correlation | .145* | |
| | Sig. (2-tailed) | .043 | |
| | N | 194 | 195 |

* Correlation is significant at the 0.05 level (2-tailed)

The Pearson correlation analysis results in the table show a significant positive correlation between experience using ChatGPT and critical thinking skills ($r = 0.145$; $p = 0.043$), although descriptive analysis of students' critical thinking skills is still relatively low. This means that the use of ChatGPT has the potential to encourage increased critical thinking skills, although the impact is not that great in practical terms. The use of ChatGPT will have great potential in developing critical thinking skills if students use it actively and reflectively. In other words, students who are accustomed to exploring ChatGPT features or evaluating the answers given tend to be more trained in higher-order thinking activities. However, unfortunately, the potential of this technology has not been optimally utilized, which is reflected in the still low thinking skills of students with a high percentage of ChatGPT users. The majority of students still use ChatGPT passively, only to get quick answers, not as a means of deepening understanding or conducting critical reflection. This condition is in line with research [33] which revealed that although many students acknowledge the benefits and speed of ChatGPT in generating ideas and conducting analysis, there is a tendency to rely on instant answers without proper evaluation. This emphasizes that the use of ChatGPT must be directed in an educational manner and accompanied by good guidance so as not to weaken students' critical thinking skills [34] . However, if ChatGPT is used actively and reflectively, for example through activities such as evaluating answers, comparing various perspectives, or critiquing arguments generated by AI, there will be a significant increase in critical thinking and metacognitive skills. ChatGPT can actually be an effective tool for independent learning and academic personalization for students in physics learning. However, in reality, the majority of students only use it passively, and some only copy answers without further processing [35]. [11] . This fact strengthens the argument that the use of ChatGPT without direction or without education will not have a significant impact on improving critical thinking skills. This means that it is not only the use of ChatGPT that is important, but how students use it and determine its impact on the development of their critical thinking skills. Unfortunately, the findings in this study indicate that high use of ChatGPT but not accompanied by adequate awareness and education actually makes students' critical thinking skills remain low.

## 5. Conclusions and Implications

In conclusion, this study examined the profile of ChatGPT usage among physics education students at Medan State University, in terms of critical thinking skills. The results showed a positive correlation between ChatGPT usage and critical thinking skills, although students' critical thinking skills were still in the low category. This means that ChatGPT has great potential to improve students' critical thinking skills if used effectively through in-depth analysis and evaluation processes, rather than simply copying answers instantly, as was the tendency of students in this study. This study provides insights into optimizing AI technology in physics education, outlining ChatGPT's potential contribution to building and developing critical thinking skills. Furthermore, this study has limitations in its sample size, which only included

Physics Education students at UNIMED, and the use of self-reported data, which could potentially introduce perception bias. Therefore, future research is recommended to involve a broader sample across institutions, use a longitudinal approach to track the development of critical thinking skills over time, and explore the effectiveness of ChatGPT on various physics topics and types of academic assignments. The following research also needs to consider external factors such as lecturer teaching strategies, classroom atmosphere, and collaboration between students, which also need to be explored because they have the potential to influence the optimization of the use of ChatGPT in physics learning [36] [37] .

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