

The Effect of Artificial Intelligence (AI) Chat GPT and Hard Work Character on College Students' Critical Thinking Skill

Safira Rizki Ramadhanti^{1,*}, Patmisari¹

¹ Faculty of Teacher Training and Education, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia

* Corresponding author: a220210007@student.ums.ac.id

Abstract

Purpose: This study aims to determine the effect of Artificial Intelligence (AI) Chat GPT and hard work character on students' critical thinking skills.

Methodology: This study uses a quantitative method with a correlational design. The population in this study was 5,582,774 students who live in Java. The sample taken in this study was 270 students. Data collection techniques involve distributing questionnaires to students who fit the criteria. This study uses prerequisite test data analysis techniques, namely the normality test, multicollinearity test, and heteroscedasticity test. Hypothesis testing is done using the T test and F test.

Results: The results showed a positive relationship between the use of Chat GPT and students' critical thinking skills. There is a positive influence between the use of Chat GPT on critical thinking skills characterized by 207 or 76.7% of students have high knowledge, skills in using, and frequency of using Chat GPT. There is also a positive relationship between the character of hard work and students' critical thinking skills, which is characterized by 208 or 77% of students having a hard work character during their college life. Students who have critical thinking skills or high level thinking are 241 or 89.3% of students.

Applications/Originality/Value: This research can be a reference material for developing more effective learning methods in the digital era. The renewal of this research with previous studies is because it combines two variables simultaneously, namely the use of Chat GPT and the character of hard work on students' critical thinking skills.

Introduction Section

Critical thinking skills are one of the 21st-century abilities that must be possessed (Rahardian, 2022). This is also in line with what Aini dan Ridwan (2021) explained that in this industrial era 4.0, critical thinking skills require us to have superior human resources and skills that can filter negative things, namely critical thinking skills. However, the GPA data shows students' critical thinking skills are still low. The misuse of technological conveniences can cause this low critical thinking ability. Technology should be maximized to find new materials and information to support learning. This can be seen from the results of digital skills in digital literacy which stagnate every year. The lack of digital skills can lead to increasingly widespread plagiarism, especially with increasingly sophisticated technology such as Artificial Intelligence (AI) Chat GPT.

Table 1. Grade Point Average (GPA) of Indonesian College Student

Bidang Studi	IPK
Agama	3,38
Pendidikan	3,38
Ekonomi	3,37
Seni	3,37
Kesehatan	3,36
Sosial	3,36
Humaniora	3,35
Pertanian	3,35
MIPA	3,24
Teknik	3,23

Source: Higher Education Statistics Year 2022

Critical thinking skills are one of the factors that support student success in obtaining academic achievement. The success of student academic achievement in higher education can be seen through the cumulative grade point average (GPA) (Nuraini & et al, 2019). Based on a study conducted by Hasnawati (2024) someone with high academic ability tends to have an excellent ability to analyze, interpret, and explain the material studied in lectures so that they will be

encour-aged and motivated to analyze the information obtained critically. Based on the Ministry of Education and Culture (2022) in table 1, the average cumulative grade point average (GPA) of student achievement in Indonesia in 2022 is still below 3.50 from various fields of study. This shows that the critical thinking skills of students in Indonesia are still not high.

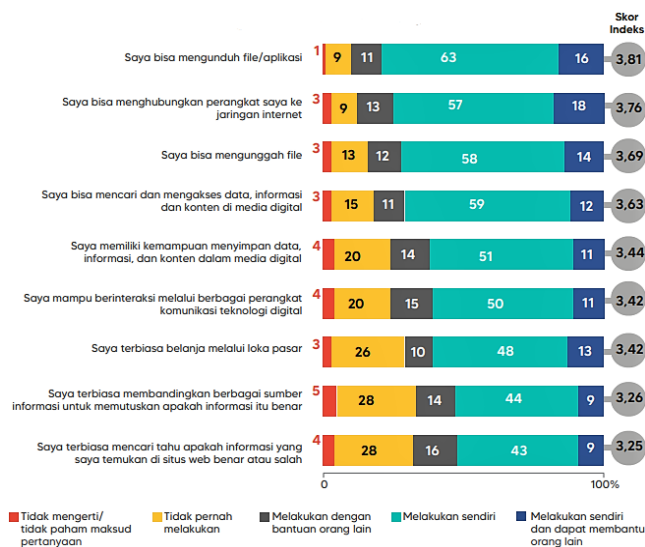


Figure 1. Digital Skill Pillars in Indonesia in 2022

The 2022 national digital literacy index is 3.54 on a scale of 1-5 based on Directorate General of Information Application (2022). Of the four pillars of digital literacy (digital skills, digital ethics, digital safety, and digital culture) the problem in this study is digital skills. The digital skills index increased by 0.08 points from 3.44 in 2021 to 3.52 in 2022. Even though it increased, it still shows a low value for an Indonesian country with a large population. This pillar was chosen because of the low level of Indonesian people in comparing information and finding out the credibility of information obtained on the internet, as can be seen in figure 1.

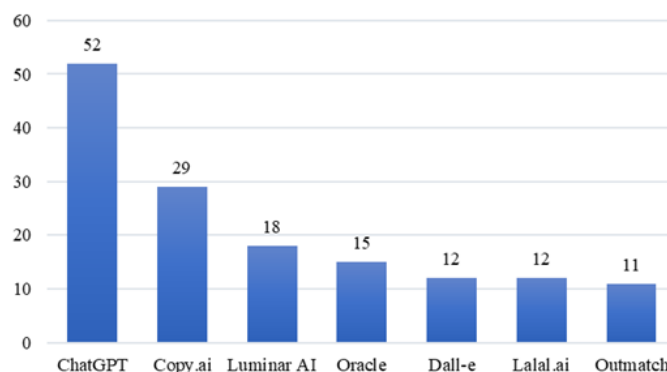


Figure 2. Artificial Intelligence Most Used in Indonesia

Source: Populox Survey Year 2023

In its report, Writer Buddy said there were more than 24 billion visits to the 50 most popular Artificial Intelligence (AI) tools generated from September 2022 to August 2023. Where the average monthly growth itself is around 236.3 million visits (Sarkar, 2023). Indonesia is ranked third with the most Artificial Intelligence users, accounting for 1.4 million visits. According to a survey from Populix reported by Databoks (Annur, 2023), Chat GPT is Indonesia's most widely used Artificial Intelligence. It is recorded that in 2023, as many as 52% of respondents have used the Artificial Intelligence Generator platform which can be seen in figure 2.

Artificial Intelligence has a good opportunity to improve student learning efficiency in the academic field (Putri & et al, 2023). Because each student's learning ability is different, as explained by Rachbini (2023), the emergence of Chat GPT provides more flexibility and accessibility to students to get information related to material easily and quickly. However, this must also be considered because the convenience offered by the system has an impact on user dependence and the lack of critical thinking skills in students. In line with what Santoso (2023) said, because of the conveniences students get from Chat GPT, it can cause laziness in students, such as procrastination in completing assignments, dependence on the use of technology, and reduced students' critical thinking skills in solving a problem.

Another impact of AI Chat GPT is that it makes plagiarizing other people's work easier. Data from the Retraction Watch Database, a website that reports retractions of scientific papers, shows that the number of articles by Indonesian authors that are retracted is increasing. In 2022, for example, 18 articles were retracted. Meanwhile, according to data in the Retraction Watch Database (2022), as of March 2024, the number has reached 27 articles. Retractions are made if there are indications of data falsification, plagiarism, incorrect authorship claims, repeated article submissions, or general errors related to the professional code of ethics.

Based on the problems that have been described, research with the title “The Effect of Artificial Intelligence (AI) Chat GPT and Hard Work Character on Col-lege Students' Critical Thinking Skill” is important to do.

Literature Review

Critical Thinking Skill

Critical thinking ability is a skill in terms of high-level thinking to solve a problem through identification, observation, analysis, making conclusions, and making decisions rationally and objectively (Anggraeni & et al, 2022). In the context of student, Anggraeni (2022) explained that the critical thinking process is a very dynamic process with structured activities. These activities start by finding differences in information, collecting data, analyzing data, evaluating it, and making conclusions based on the data that has been collected (Maulana, 2017).

Indicators of critical thinking used in this study are based on Angelo' (2024) explanation, first, analyzing skills, which are the ability to try to interpret the meaning of information. Second, synthesizing skills are the ability to combine various parts into a new arrangement and integrate their thoughts to get the find-ings. Third, the skill of recognizing and solving problems, namely the ability to observe a problem and then be motivated to find a solution through logical think-ing. Fourth, inferring skills, namely the skill of sorting out which arguments are well accepted (empirical solid evidence), or, in other words, concluding the re-sults of a problem. Last, evaluation skills are judging something based on specific criteria.

Students must have skills that filter out negative things, including critical thinking skills (Aini & Ridwan, 2021). These critical thinking skills are influ-enced by internal factors, external factors, and learning approach factors (Syah, 2019). Internal factors include individual characteristics, which in this study use the character of hard work. External factors include learning resources and tech-nological guidance, which in this study uses artificial intelligence chat gpt. Criti-cal thinking skills will decrease if individuals are easily satisfied using instant methods and depend on technology. This is in line with the results of Hastini (2020) research, which states that Generation Z has a dependence on technology, but they are less able to criticize the validation of the information obtained and are easily satisfied with something they do. The hypothesis can be compiled that the variable critical thinking ability is influenced by the use of Chat GPT and the character of hard work.

Artificial Intelligence (AI) Chat GPT

On November 30, 2022, OpenAI launched advanced technology, a chatbot-known as Chat GPT or Conversational Generative Pre-training Transformer. Chat GPT (Generative Pre-training Transformer) is an artificial intelligence system that functions to communicate or interact in text-based conversations. (Suhar-mawan, 2023). It is also explained by Hutapea & Rantung (2024) stating that Chat GPT is a chatbotssystem that uses the GPT algorithm anddeep learning so that it can understand and process what is spoken by humans and make deci-sions. Studies conducted by (Laksana & Fiangga, 2022) conveying chatbot de-velopment in the field of education can be in the form of making interactive quizzes and automatic question and answer assistance. Ramadhan (2020) argue that using Artificial Intelligence chatbots can make it easier for students to learn. This is because artificial intelligence can be used practically anywhere and can interact like a friend or teacher who provides assistance when learning.

The indicator used to measure student attitudes about GPT chat is to use the technology acceptance model (TAM) described by Davis in (Hutapea & Rantung, 2024). This TAM model has five main factors, first, Perceived Ease of Use (PEOU), a measure by which a person believes that computers can be easily un-derstood and used. Includes easy to learn a technology, easy to do what the user wants, easy to improve user skills and the technology is easy to use. Second, Perceived Usefulness (PU) is a measure by which the use of a technology is believed to bring benefits to the people who use it. This includes making work easier and more useful, increasing productivity and effectiveness, and developing job performance. Third, Attitude Toward Using (ATU) is an attitude towards using tech-nology in the form of acceptance or rejection when someone uses the technology in their work. Fourth, Behavioral Intention to Use (ITU) is the behavioral tenden-cy to keep using technology. Includes the desire to add users, the motivation to keep using, and the desire to motivate other users. Last, Actual System Usage (ASU) is the real condition of using a technology. Includes the frequency and duration of time users use a technology.

Chat GPT has a positive and negative influence on critical thinking skills. Re-search conducted by Haidir (2024) explains that Chat GPT can help analyze a problem when group discussion tasks or individual assignments take place and can also provide impulses to encourage students to think further about the infor-mation obtained. The ability to analyze is one of the indicators of critical think-ing ability, according to Angelo (2024). On the other hand, Salim (2023) states that if a person is too dependent on Artificial Intelligence technology such as Chat GPT, then that person cannot effectively

develop the ability to analyze, evaluate, and make decisions. So the hypothesis can be compiled that the variable use of Artificial Intelligence Chat GPT affects the critical thinking ability variable.

Hard Work Character

Hard work is an attitude, personality, character, character and strong belief in an activity carried out with maximum effort to achieve achievement or good results (Marzuki, 2019). Another definition of hard work is a process that a person does by showing serious effort to achieve success in completing work or tasks (Wadu & et al, 2020). Based on these theories, it can be concluded that hard work is an effort in the form of action by each individual in completing their responsibilities until completion.

Five indicators are used based on Daryanto dan Darmiatun (2013) explanation, first, hard work and enthusiasm for learning. Someone with the character of hard work will prioritize learning and doing assignments rather than other less useful activities (Kurniawan, 2024). The sub-indicators of active and enthusiastic learning are attending every lecture, being active in class, looking for additional material, and studying even if there are no exams or assignments. Second, working hard. The explanation of this indicator is to do a task solemnly and seriously (Rahmah & et al, 2019) so that it is in accordance with the specified time (Arumingtyas, 2021). The sub-indicators of this indicator are searching from various reading sources, discussing with friends, collecting assignments on time, not procrastinating, and not working close to the collection deadline. Third, they are not easily discouraged. Students who are resilient in facing difficulties can also be said to have the character of hard work because they are not easily discouraged when they find difficulties and are motivated to find solutions to the difficulties they face (Bahriah & et al, 2022). The sub-indicators of not giving up easily are continuing to try to solve and ask for help to get solutions to the problems experienced. Fourth, not depending on others. This means activities when individuals learn independently, do not depend on anyone or anything, and have the will and responsibility to complete their learning (Aslamiah & et al, 2019). The sub-indicators of not depending on others are doing assignments independently, not cheating, not using jockeys, and not plagiarism. Last, try your best. This indicator explains that it is about trying to do the best or maximum when studying with the aim of achieving the best results (Yeni, 2022). The sub-indicators of trying your best are completing tasks thoroughly, utilizing all facilities, and asking questions when you don't understand something.

The character of hard work is needed so that someone does not give up easily in solving problems that require critical thinking. The results of research conducted by Aini (2018) show that the character of hard work positively affects critical thinking skills. This means that when someone has a hard work character, their critical thinking skills will also increase (Prayogi & Widodo, 2019). So, the hypothesis can be compiled that the hard work character variable affects the critical thinking ability variable.

Research Methods

The research method used is quantitative correlation. Quantitative research is an assessment of social problems based on testing theories consisting of variables measured by numbers and analyzed by statistical procedures to find whether the predictive generalization of the theory is correct (Ulber & Atif, 2018). According to (2018), correlational research is a type of research that examines problems in the form of a relationship between two or more variables to determine whether or not there is a relationship between variables or to make hypotheses based on the relationship between variables. The population used in this study was 5,582,774 students on the island of Java. The sample taken in this study was 270 students from the total population based on the Isaac and Michael table using a 10% significance level. Data collection in this study used random purposive sampling by filling out a questionnaire using a 1-4 Likert scale. The use of Chat GPT was measured using indicators from Davis cited by Hutapea (2024) with a total of 13 favorable statements and 4 unfavorable statements. The measurement of hard work character uses indicators from Daryanto (2013) with a total of 13 favorable statements and 5 unfavorable statements. Furthermore, to measure critical thinking skills using indicators from Angelo (2024) with a total of 14 favorable statements and 1 unfavorable statement. The criteria for respondents in this study are as follows: 1) Active students for state universities and private universities, 2) currently studying/residing in Java Island, and 3) using Chat GPT for college purposes. Students who meet these criteria fill out a questionnaire via Google Forms.

Quantitative research uses measurement instruments that have been tested, so data validity testing is needed. In this study using the validity test and reliability test based on Sugiyono's theory (2018) and using the SPSS 27 application to process data. In the validity and reliability tests using 43 respondents who fit the criteria. The first variable tested is the use of Chat GPT which is measured by indicators of perceived ease of use (PEOU), perceived usefulness (PU), attitude toward using (ATU), behavioral intention to use (ITU), and actual system usage (ASU). The use of Chat GPT is measured using a questionnaire consisting of 14 questions that measure students' use of Chat GPT for college purposes, which are divided into 5 indicators. Ease of use: for example. 'Students find Chat GPT easy to access', benefits of use: for example. 'Chat GPT helps students complete college assignments quickly', attitude of use: for example. 'Students fully trust the information provided by Chat GPT', usage tendency: for example. 'Students use Chat GPT as the only source of information', and actual conditions of use: for example. 'Students only rely on Chat GPT in doing college assignments'. Respondents responded to the 14 questions on a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree), with higher scores indicating higher utilization of Chat GPT. After conducting a validity test for 14 questions using

43 samples of respondents, the results showed that all questions were valid and none were invalid. The reliability test of this research instrument will use the Cronbach Alpha technique, the Cronbach Alpha value for the Chat GPT usage variable is 0.840, then > 0.6 , so it can be stated that the instrument has reliable reliability.

The second variable tested for validity and reliability is the character of student hard work. This variable is measured by indicators of eagerness and enthusiasm for learning, working hard, not giving up easily, not depending on others, and trying their best. The character of hard work is measured using a questionnaire consisting of 18 questions that measure the character of students' hard work during college, which is divided into 5 indicators. Enterprising and eager to learn: for example. 'Students study course materials even though there are no exams or assignments', doing assignments seriously: for example. 'Students submit assignments on time', not easily discouraged: for example. 'Students continue to try to complete assignments despite experiencing difficulties', not relying on others: for example. 'Students use Artificial Intelligence (for example. Chat GPT) in doing assignments by directly copying answers', and trying their best: for example. 'Students do assignments thoroughly'. After conducting a validity test for 18 questions using 43 samples of respondents, the results showed that all questions were valid and none were invalid. The reliability test of this research instrument will use the Cronbach Alpha technique, the Cronbach Alpha value for the hard work character variable is 0.819 then > 0.6 , so it can be stated that the instrument has reliable reliability.

The last variable tested for validity and reliability is critical thinking ability. This variable is measured by indicators of analysis skills, synthesis skills, recognition and problem solving skills, conclusion skills, and evaluation skills. Critical thinking skills are measured using a questionnaire consisting of 15 questions that measure students' critical thinking skills, which are divided into 5 indicators. Analyzing skills: for example. 'Students can analyze the validity of the information sources obtained', synthesizing skills: for example. 'Students are able to combine information from different sources', recognition and problem solving skills: for example 'Students are able to identify the core of the problem (Example: students have difficulty in understanding the material)', inferring skills: for example 'Students review the results of student work (assignments)', and evaluating skills: for example 'Students only trust from one source of information obtained'. After conducting a validity test for 15 questions using 43 samples of respondents, it was found that all questions were valid and none were invalid. The reliability test of this research instrument will use the Cronbach Alpha technique, the Cronbach Alpha value for the hard work character variable is 0.887 then > 0.6 , so it can be stated that the instrument has reliable reliability.

After being declared valid and reliable, questionnaires were distributed to 270 samples which were then subjected to prerequisite tests and hypothesis testing. This study uses three prerequisite test techniques using SPSS 27, namely the normality test according to Priyatno (2018) using the one sample Kolmogorov-Smirnov test, the multicollinearity test based on Priyatno' (2018) theory using tolerance and VIF values, and heteroscedasticity test using the Glejser test according to Ghazali (2021). The prerequisite test uses SPSS 27 to process primary data. In hypothesis testing, partial and simultaneous tests based on Priyatno' (2018) theory were used, and SPSS 27 was used to process the data. There are 3 hypotheses tested in this study.

Research Results and Discussion

Data Description

From the results of data collection with questionnaires distributed using google form, 270 respondents were obtained. The data obtained was verified beforehand to remove invalid data that would affect the results of the research data analysis. These respondents are categorized into several groups based on gender, age, domicile, and artificial intelligence chatbot used.

Table 2. Respondent Characteristics

Characteristics	Total Respondents	Percentage
Gender		
Female	217	80%
Male	35	20%
Age		
17 years old	30	11%
18 years old	18	7%
19 years old	14	5%
20 years old	31	11%
21 years old	86	32%
22 years old	44	16%
23 years old	26	10%
24 years old	21	8%
Domicile		
Jakarta	63	23%
Banten	19	7%

West Jawa	90	33%
Yogyakarta	25	10%
Central Jawa	38	14%
East Java	35	13%
Artificial Intelligence		
Used		
Chat GPT	270	100%
Gemini AI	122	44,9%
Perplexity	112	41,2%

Table 2 shows that out of 270 respondents, the most common gender is female with 217 people or 80% of respondents. The most age is at the age of 21 years with 86 people or 32% of respondents. The next characteristic is domicile, a total of 90 people or 33% of respondents live or are studying in West Java. The last characteristic is the Artificial Intelligence Chatbot, which is used the most, name-ly Chat GPT, with a total of 270 people 100% of students using it.

Data Analysis Results

Analysis Prequisite Test

The first prerequisite analysis test carried out is the normality test. The data normality test aims to determine whether or not the data used in the research model has a normal distribution (Priyatno, 2018). Normality testing in this study used the one sample Kolmogorov-Smirnov test through the SPSS program. In testing using Kolmogorov-Smirnov, data or variables that can be said to be nor-mally distributed are when the significance value is ≥ 0.05 . Conversely, if the significance value ≤ 0.05 , it can be said that it is not normally distributed. Based on the calculation results, it is known that the significance value is $0.15 > 0.05$. So it can be concluded that the residual value is normally distributed.

The next prerequisite analysis test is to use the multicollinearity test. The mul-ticollinearity test is a test that aims to test or analyze the regression model wheth-er there is a correlation between independent variables also known as independ-ent variables (Priyatno, 2018). The absence of correlation in the independent variables is a good regression model. The multicollinearity test uses the calcula-tion of the tolerance value and the value inflation factor (VIF). Data can be said not to exist or occur multicollinearity if the VIF value < 10 and tolerance value > 0.1 . Conversely, if the VIF value > 10 and the tolerance value < 0.1 , it can be said that it is detected or there is multicollinearity in the study. Based on the calcula-tion results, the tolerance value is $0.845 > 0.1$. Furthermore, the VIF value ob-tained a value of $1.183 < 10$. So, the regression model of the effect of Chat GPT on critical thinking skills does not occur symptoms of multicollinearity.

Last, using the heteroscedasticity test. The heteroscedasticity test aims to test whether the regression model causes inequality of variance from the residuals of an observation to another observation (Ghozali, 2021). In this study, to test the presence or absence of heteroscedasticity is to use the Glejser Test. The basis for decision making using the Glejser test is if the Significance value (Sig.) > 0.05 , it can be said that there are no symptoms of heteroscedasticity in the regression model. Conversely, if the Significance value (Sig.) < 0.05 , then there are symp-toms of heteroscedasticity. Based on the calculation results, the significance val-ue is $0.19 > 0.05$. So, the regression model of Chat GPT's influence on critical thinking skills does not cause heteroscedasticity problems

Hypothesis Test

The first hypothesis, “The use of Artificial Intelligence (AI) Chat GPT has an influence on students' critical thinking skills”, uses the T test to process the data in the Windows 27 statistical program. These results are presented in the follow- ing table 3.

Table 3. The Result of the First Hypothesis T Test Analysis

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std. Error	Beta		
(Constant)	26,407	2,405		10,980	<0,001
Chat GPT	0,436	0,044	0,519	9,932	<0,001

Source: Primary data processed, 2024

According to Priyatno (2018) with the T test which is useful for knowing the effect of the independent variable partially or individually on the dependent var-iable, whether it has a significant effect or not. The basis for decision making is by looking at the comparison between the significance value and the alpha value (α) = 0.05. If the significance value < 0.05 , then H_0 is rejected, which means that the independent variable affects the dependent variable. Conversely, if the sig-nificance value > 0.05 , then H_0 is accepted, which means that the independent variable does not affect the dependent variable. Based on table 3, it can be seen that the results of simple regression analysis obtained a coefficient for the Chat GPT usage variable of 0.436 with a constant of 26.407, so that the regression equation model obtained is as follows:

$$Y1 = 26,407 + 0,436X1$$

The results of empirical tests of the effect of using Chat GPT on thinking ability show that the t value of 10.980 is positive with a significance result of $0.001 < 0.05$. This shows that H_0 is rejected and H_a is accepted, in other words, there is a positive influence between the use of Chat GPT (X_1) on critical thinking skills (Y) for the first hypothesis. There are 207 or 76.7% of students who have high knowledge and skills in using Chat GPT and a high frequency of using it. As many as 59 or 21.9% of students have moderate knowledge, skills in using, and frequency of use of Chat GPT. The remaining 4 or 1.5% of students have the lowest knowledge, skills in using, and frequency of use of Chat GPT. Students use Chat GPT for college purposes, such as as a tool to help them do assignments and understand the material, sources of information, and others.

Chat GPT can affect critical thinking skills, both badly and well. Based on the research conducted, Chat GPT has a good effect on students' critical thinking skills. According to Prasetyo (2021), this is because students' internet skills and internet attitudes are high in utilizing computers and accessing the internet in everyday life. Based on the results of Manurung's research (2023), it is also explained that students' thinking abilities can be widely open from various points of view and can maximize students' thinking abilities effectively and efficiently by using Chat GPT to help with assignments and other academic needs. With the increasing thinking ability of students, there is an increase in formulating the main points of the problem well, and the mindset of students is increasingly critical. In using ChatGPT, the ability to conclude will increase due to search results that have been narrowed down and adjusted in more detail regarding the questions that will be asked to Chat GPT.

According to Essel's (2024) research results, using Chat GPT for classroom tasks can effectively improve critical thinking skills. This can happen because the use of Chat GPT encourages users to engage in dialog with Chat GPT's AI model, which encourages users to think critically. Chat GPT can facilitate critical thinking skills by providing a platform for users to interact with diverse perspectives and ideas (Kasneji & Sessler, 2023). This aligns with what Darvishi (2022) says Chat GPT can provide feedback and guidance to users, which can help them develop a deeper understanding and improve their critical thinking skills. With a deeper understanding of learning styles and their respective comprehension levels, AI systems can provide customized recommendations and learning materials. The personalized learning procedure by the AI model of Chat GPT can benefit users who struggle to exercise critical thinking skills and need additional help to improve their skills (Rospiogliosi, 2023).

The second hypothesis, namely "The character of hard work influences students' critical thinking skills" is still the same as the first hypothesis, namely using simple regression analysis with a T test based on Priyatno's theory using the Windows 27 statistical program. The output results from SPSS are as follows.

Table 4. The Result of The Second Hypothesis T Test

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std. Error	Beta		
(Constant)	13,972	1.929		7,244	<0,001
Kerja Keras	0,619	0,033	0,755	18,871	<0,001

Source: Primary data processed, 2024

Based on table 4, it can be seen that the results of simple regression analysis obtained a coefficient for the hard work character variable of 0.619 with a constant of 13.972 so the regression equation model obtained is as follows:

$$Y2 = 13,972 + 0,619X2$$

The empirical test results of the effect of hard work character on critical thinking skills show the t value of 7.244 is positive with a significance result of $0.001 < 0.05$. This shows that H_0 is rejected and H_a is accepted, in other words, there is a positive influence between the character of hard work (X_2) on critical thinking skills (Y) for the second hypothesis. There are 208 or 77% of students with high hard work character. 61 or 22.6% of students have a medium hard work character in themselves. The remaining 1 or 4% of students have a low hard work character.

The character of hard work is needed so that someone does not give up easily in solving problems that require critical thinking skills. The results of research conducted by Aini (2018) show that the character of hard work positively influences critical thinking skills. This means that when someone has a high hard work character, their critical thinking skills will also increase (Prayogi & Widodo, 2019). This finding is in line with Ibrohim's (2019) research which found that there is a positive influence of hard work character on critical thinking ability.

In addition, Danoebroto explains that an important factor influencing critical thinking skills is the student's attitude, which includes self-confidence, determination, hard work, perseverance, and consistent practice (Reski & Hutapea, 2019). These attitudes form a strong foundation for developing individuals' critical thinking and problem-solving skills. Students with the character of hard work tend to be more independent in completing assignments independently without the help of

jockeys and do not plagiarize the work of others. Because plagiarism often arises from a lack of research skills, poor vocabulary, and weak critical thinking skills (Wahyuni, 2019).

The third hypothesis uses multiple regression analysis and F-test. This is used to determine whether all the independent variables included in the model have a joint influence on the critical thinking ability variable (Priyatno, 2018). The test criteria use a significance value of 0.05. The output results from SPSS are:

Table 5. The Result of the Third Hypothesis F Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig
Regression	5785,821	2	2892,910	226,083	<0,001
Residual	3416,479	267	12,796		
Total	9292,300	269			

Source: Primary data processed, 2024

Table 5 shows that the results of the F test obtained an F-count value of 226,083 with a significance level of 0.001 <0.05. This shows that there is a relationship between Chat GPT variables, hard work character, and critical thinking skills.

Table 6. Coefficient of Determination Test Result

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,793	0,629	0,629	3,577

Source: Primary data processed, 2024

Table 6 shows that the results of the coefficient of determination test obtained an Adjusted R Square value of 0.626, which means that 62.6% of the critical thinking skills of students on Java Island are influenced by the use of Chat GPT and the character of hard work. While the remaining 37.4% is influenced by variables outside the model studied. Students who have critical thinking skills or high-level thinking are 241 or 89.3% of students. So there are 29 or 10.7% of students who still have low-level thinking skills

Critical thinking skills are influenced by external and internal factors. External factors are factors that come from outside the individual (Suciono, 2021). One of the external factors that influences critical thinking skills is the presence of technology, one of which is Artificial Intelligence (AI) Chat GPT. A study conducted by Istofany (2024) has proven that technology improves cognitive skills and overall learning outcomes when used in education. Research conducted by Muhibbin (2022) states that to achieve critical thinking skills, which is one of the goals of Indonesian education, learning is needed that is adapted to the development of technology and information. It is also reinforced by Rudyanto (2023) that there is a relationship between creativity and critical thinking with the use of digital media. However, it is important to choose and integrate technology wisely in order to truly improve critical thinking skills effectively (Abidin & et al, 2024). Some previous research shows the positive impact of technology in education. One study found that the use of technology can significantly improve student learning outcomes, including cognitive and critical thinking skills (Khotimah & et al, 2023). Other studies have also shown the positive impact of using technology in stimulating critical thinking skills (Suyuti & et al, 2023). Students often face major challenges in various disciplines that require complex data analysis, such as statistics, computer science, and mathematics. However, Azzahra (2023) stated that with the help of Chat GPT, they can utilize sophisticated algorithms and statistical models to analyze data more effectively. This is also supported by research conducted by Kurniawan (2024) that Chat GPT also provides many sources of information that help broaden students' knowledge and insights, encourage creativity, and improve critical thinking skills.

Internal factors are factors that come from within the individual (Suciono, 2021). One of the internal factors that influence critical thinking skills is individual character, which in this study focuses on the character of hard work. Individuals who think critically tend to have an open attitude, value honesty, respect for various data and opinions, and be serious in doing so. Their attitude will change when they get a different but useful and constructive view (Prameswari & et al, 2019). High curiosity and hard work character are important characteristics for individuals with critical thinking skills, they always try to find answers to the questions they ask (Saleh, 2019). This view is supported by Waryainah (2022), who states that the character of hard work includes the ability to make maximum efforts and never give up on achieving the desired goals.

Conclusion

Based on the results of the research conducted, it can be concluded that there is a positive influence between the use of Chat GPT on critical thinking skills. If applied properly, Students with the knowledge and skills in using Chat GPT can hone their critical thinking skills. There is also a positive influence between the use of hard work character on critical thinking ability. Critical thinking begins with curiosity and trying to find the answer, this can be improved by the character of hard work. The use of GPT Chat and hard work character have a joint influence on critical thinking ability. When the use of Chat GPT and the character of hard work are combined, both have a more significant effect on students' critical thinking skills, indicating that integrating technology and personal character can optimally support the development of

critical thinking skills in the learning process. So it can be said that students who use Chat GPT for college purposes do not all have low thinking skills, it can actually improve their critical thinking skills as long as the character of hard work accompanies it.

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