

The impact of ChatGPT on the critical thinking ability of UIN Sunan Kalijaga students

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Abstract: This study aims to identify and analyze the impact of using ChatGPT, an artificial intelligence (AI) language, on students' critical thinking. The use of ChatGPT is becoming common at this time to get information and instant needs of students. However, the impact on critical thinking skills in students still needs to be studied. This research method uses quantitative methods. Giving questionnaires to a group of students who use ChatGPT is carried out online, data from this study is used to identify the impact of using ChatGPT on students' critical thinking levels. Using quantitative methods and online questionnaires, the study was able to collect relevant and detailed data on the impact of using ChatGPT. This makes it easier for researchers to identify data, as well as provide a deeper understanding of ChatGPT's influence on students' critical thinking. The results in the research we have done obtained 3.593 on the Likert scale. This shows that ChatGPT has a moderate effect on critical thinking skills. Dependence on the use of ChatGPT can reduce the level of critical thinking skills. Therefore, it is important to remember that although this study obtained positive results, the use of ChatGPT should be balanced with the development of independent critical thinking skills and critical evaluation of the information provided by the AI model.

Keywords: artificial intelligence, ChatGPT, critical thinking, college student, OpenAI

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Introduction

People in the 5.0 era must be literate in information and communication technology. When various industrial fields and needs began to turn digital and began to take advantage of AI, Big Data, robotics, automation, machine learning, and the Internet of Things, that was when Industry 5.0 technology began to emerge [1]. Technology is a tool that can help, facilitate, and improve learning activities. Artificial intelligence technology, sometimes known as AI, is one such technology that is possible and should be used. AI is an imitation of human intelligence that is based on machines and programmed to think like humans [2].

AI technology is designed because it provides benefits for its users in terms of efficiency. AI can do jobs that are faster and more accurate than humans, including data processing, risk analysis, and decision-making ability [3]. ChatGPT is one of the AI technologies that is trained to interact in a conversational way [4]. ChatGPT which is a Natural Language Processing or NLP (Natural Language Processing) tool can understand and produce human-like conversation and writing [5]. Since its release by OpenAI on November 30, 2022 [6], ChatGPT has become popular after gaining worldwide popularity and attention for its extraordinary ability to generate coherent, systematic, and informative responses [7].

ChatGPT can provide extraordinary responses because it has a large data store and an efficient design to understand and explain user requests [8]. ChatGPT can also be used in health education for various purposes, such as enhancing individualized learning and emphasizing critical thinking and problem-based learning [9]. In addition, ChatGPT can be used to analyze students' understanding of direct evaluation of given assignments [10]. However, there are concerns about the potential of AI technology to spread bias and stereotypes [11]. However, users are expected

not to be complacent about using ChatGPT because it can cause negative dependencies. This dependence can lead to a decrease in critical thinking power and the level of creativity [12].

Therefore, Nadia Fairuza, a researcher at the Center of Indonesian Policy Studies (CIPS) stated that the use of ChatGPT must be accompanied by adequate mastery of critical thinking skills. In addition to overcoming this dependence, this aims to make the use of ChatGPT among students productive and appropriate [13]. In the theory of effectiveness, effective technology is a system that can provide added value or positive influence on user behavior [14]. In the rapid development of technology, it is necessary to have the ability to think critically in dealing with various problems in the personal and social life of society [15].

The ability to think critically means being able to reflect actively and sustainably. It is based on in-depth investigation using thinking and reflection procedures to develop valid, correct, and convincing findings [16]. Critical thinking always tries to diagnose or validate something that already exists so that it becomes a probability. In critical thinking, probability has the meaning to always evaluate information based on analytically strong evidence and facts. In addition, critical thinking skills are also convergent. This relates to skills in seeking information from various sources to broaden views on a topic. So that it can be said that the ability to think critically emphasizes the ability to combine many things into one thought by the rules allowed by the general public [17]. Facione divides six components in critical thinking skills, namely the ability to interpret, analyze, evaluate, infer, explain, and self-regulate [18].

College students are an active community that uses the internet. This is in accordance with data from the 2023 report on Indonesia's internet penetration rate conducted by the Indonesia Internet Service Provider Association. In this data, student profiles show that they are the largest internet users in Indonesia with a penetration rate of 98.88% [19]. So with this students are required to think critically about various information. The quality of a nation's human resources, especially students who rely on education, determines its progress. Education enables students to study well and reach their full potential [20]. To improve students' critical thinking skills, it is necessary to innovate in the world of education, especially in terms of learning [21]. The use of information and communication technology itself can improve student achievement and cognitive abilities [22].

The State Islamic Religious College (PTKIN) is critical to the improvement of education in Indonesia. This is because the majority of Indonesians are Muslims [23]. UIN Sunan Kalijaga Yogyakarta is a well-known Islamic university in Indonesia. UIN Sunan Kalijaga's scientific development foundation uses the term integration-interconnection, which refers to a foundation that blends religious knowledge with science and technology [24]. In times of development, UIN Sunan Kalijaga remains committed to sustaining the quality of its graduates. This is reflected in the prizes it has received, such as Cyber Campus and Libraries that use RFID technology, also known as Radio Frequency Identification [25].

With the rapid development of technology, we need to understand its impact on various aspects of life, one of which is education. Therefore this study aims to determine the effectiveness and influence of ChatGPT on the ability to think critically in the real world of the academic community, especially students. The urgency of this research is very important as a form of attention to rapidly developing technology and as an update to previous studies. Considering that the number of studies on ChatGPT is still limited, this research is expected to provide benefits for educational observers. In addition, this research provides benefits for technology observers to find out how extensive the impact of ChatGPT is on students' critical thinking skills in Indonesia, especially UIN Sunan Kalijaga. Students of UIN Sunan Kalijaga became the subject of research because of the facts that occurred in the field. Students are one of the users who often use ChatGPT.

Methodology

This study uses a type of quantitative research. According to Aliga and Gunderson, quantitative research is research that seeks to explain a situation by collecting data in the form of numbers that are analyzed using certain statistical-based methods [26]. Data were analyzed quantitatively using descriptive statistics [27]. Descriptive statistics themselves can be directed at disbursing the mean (average), percentage, or mode. The aim is to see the level of frequency of an answer response [28].

The population is a collection of generalizations consisting of subjects who have certain quantities and characteristics according to those determined by the researcher [29]. The population in this study were UIN Sunan Kalijaga students who had used ChatGPT. The total population in this study was 85 people. This number has fulfilled the characteristics of the population because in sampling using the simple random method. The sample is part of the whole and the characteristics possessed by the population in the study [27]. The sample itself must be able to reflect the condition of the population. This is important because, at the end of the study, the conclusions from the sample must also be able to represent the conclusions of the population [30]. The sample in this study were students of the faculties of Science and Technology, Tarbiyah and Teacher Training, Social Sciences and Humanities, Ushuluddin and Islamic Thought, and Islamic Economics and Business at UIN Sunan Kalijaga Yogyakarta.

The sampling method in this study was simply random. According to simple random, sampling in this way is a direct sampling technique from the population randomly. The data collection technique used in this study is a survey data collection technique. Surveys or self-administered surveys are primary data collection methods by distributing questions to individual respondents or respondents [31]. In collecting data, researchers used online questionnaires via Google Forms. Questionnaires are data collection techniques that are carried out by giving a set of questions or written statements to respondents to answer [27]. The goal is to obtain data that is relevant to the research objectives and obtain data with a high level of validity and reliability [32]. The quality of the research instruments was tested by conducting validity and reliability tests using SPSS 20 software. SPSS is a computer program that has high enough capabilities to assist researchers in processing and making statistical analysis data [33]. In addition to testing the validity and reliability, SPSS 20 is used to analyze the results of this research data. A validity test is carried out to show the extent to which a measuring device can measure what it wants to measure. Meanwhile, the reliability test is used to show the consistency of a measurement result if the measurement is repeated [23].

The research instrument is a device for collecting research data so that it can be trusted, the level is reliable, precise, and can be factually accounted for [26]. In this study, the instruments were prepared based on the theory of effectiveness put forward by Sahfitri (2012) and the components of critical thinking skills put forward by Facione. The instrument used in collecting data is a question in the form of a questionnaire consisting of 8 questions. The instrument is attached in the [Table](#) below.

Table 1. Measurement Instruments

Grain	Instrument	Indicator	Variable
1	Critical thinking skills before using ChatGPT	Effectiveness	X1.1
2	Critical thinking skills after using ChatGPT	Effectiveness	X1.2
3	Ability to understand and analyze complex information (interpretation) after using ChatGPT	Components of Critical Thinking Ability	X2.1
4	Ability to describe and dissect information to identify important elements in a problem or argument (analysis) after using ChatGPT	Components of Critical Thinking Ability	X2.2
5	Ability to evaluate arguments based on validity, reliability, and reliability (evaluation) criteria after using ChatGPT	Components of Critical Thinking Ability	X2.3
6	Ability to make rational and testable conclusions based on existing evidence (inference) after using ChatGPT	Components of Critical Thinking Ability	X2.4
7	Ability to present arguments clearly and defend opinions logically (explanation) after using ChatGPT	Components of Critical Thinking Ability	X2.5
8	Ability to manage time and resources wisely when evaluating and responding to arguments (self-regulating) after using ChatGPT	Components of Critical Thinking Ability	X2.6

The answers to each questionnaire instrument in this study used a Likert measurement scale. The Likert scale is a scale for measuring the attitudes, opinions, and perspectives of respondents about research variables [34]. The Likert scale is shown in Table.

Table 2. Likert Scale

Answer Criteria	Score
Very good (VG)	5
Good (G)	4
Acceptable (A)	3
Poor (P)	2
Very poor (VP)	1

Results and Discussions

Respondents were students of FEBI (Faculty of Economics and Islamic Business), FST (Faculty of Science and Technology), FSH (Faculty of Sharia and Law), FISHUM (Faculty of Social Sciences and Humanities), FUPI (Faculty of Ushuluddin and Islamic Thought), and FITK (Faculty of Islamic Studies, Tarbiyah and Teacher Training).

A. Validity Test

In this study, the calculation of item validity was analyzed using the SPSS 20 program. Table 3 contains the following results.

Table 3. Validity Test Results

No	Variable	<i>Person Correlation</i>	Value r table	Annotation
1	X1.1	0.253	0.213	Valid
2	X1.2	0,741	0.213	Valid
3	X2.1	0.668	0.213	Valid
4	X2.2	0.674	0.213	Valid
5	X2.3	0.681	0.213	Valid
6	X2.4	0.728	0.213	Valid
7	X2.5	0.789	0.213	Valid
8	X2.6	0.671	0.213	Valid

Based on the results of the validity test in the table above, the effectiveness and critical thinking skills components show a positive value in person correlation and significance at $\alpha > 0.05$. The technique of using person correlation is a validity test analysis technique by correlating item scores and total scores [35]. This means that the respondents' answers to all items of the effectiveness variable and the critical thinking skills component are valid. So that the statements in the questionnaire can reveal something that will be measured by the effectiveness variable and the critical thinking ability component.

B. Reliability Test

In this study, the calculation of item reliability was analyzed using the SPSS 20 program. Table 4 contains the following results.

Table 4. Reliability Test Results

Variable	<i>Cronbach's Alpha</i>	Annotation
X1.1, X1.2, X2.1, X2.2, X2.3, X2.4, X2.5, X2.6	0.812	Reliable

Based on the table above, it can be seen that the Cronbach alpha produced in the research variable is 0.812. Cronbach's alpha is the most frequently used measure of reliability in

describing the consistency of a questionnaire item [36]. The scale of an item can be said to be quite reliable if Cronbach's Alpha value is equal to or more than 0.50 to 0.60 [31]. This means that all question items in each variable are reliable enough to explain each research variable. So it can be concluded that the measuring instrument can consistently provide the same results or answers, even though it is used many times.

C. Descriptive Analysis

The analysis used in this study is the mean or average value of the measurement scale on the two indicators to describe the results of the answers. This data was obtained by distributing questionnaires to UIN Sunan Kalijaga students via an online Google form questionnaire to support the effectiveness and influence of ChatGPT on students' critical thinking skills.

The following describes the answers to the respondent's questionnaire on the effectiveness variable. The results of the answers are in [Table 5](#) and [Table 6](#).

Table 5. Average Effectiveness Variable Results

Variable	Question Items	Respondents Answer					Average (of 5)
		VP	P	A	G	VG	
Effectiveness	X1.1	0	5	37	36	7	3.52
Average (100%)		0%	5.9%	43.5%	42.4%	8.2%	

Table 6. Average Effectiveness Variable Results

Variable	Question Items	Respondents Answer					Average (of 5)
		VP	P	A	G	VG	
Effectiveness	X1.2	3	13	38	24	7	3.22
Average (100%)		3.5%	15.3%	44.7%	28.2%	8.2%	

From [Table 5](#) and [table 6](#) above, it can be seen that the average level of student's critical thinking skills before using ChatGPT is 3.52 (acceptable) out of 5 measurement scales. Respondents who stated that they were very good were 8.2%, those who stated that they were good were 42.4%, those who claimed it was acceptable up to 43.5%, and those who said it was poor and very poor comprised 5.9% and 0%, respectively. The average level of student's critical thinking skills after using ChatGPT is 3.22% (enough) of 5 measurement scales. Respondents who said they were very good were 8.2%, those who said they were good were 28.2%, those who claimed it was acceptable up to 44.7%, and those who said it was poor and very poor comprised 15.3% and 3.5%, respectively. This shows that there is an average decrease in the percentage of critical thinking skills after using ChatGPT by 0.30%. So the dependence on using ChatGPT has an effect that harms the critical thinking skills of UIN Sunan Kalijaga students.

The following describes the answers to the respondent's questionnaire on the component variables of critical thinking skills (interpretation, analysis, evaluation, interference, explanation, and self-regulation). The results of the answers are in [table 7](#), [table 8](#), [table 9](#), [table 10](#), [table 11](#) and [table 12](#).

Table 7. Results of the Average Variable Components of Critical Thinking Ability

Variable	Question Items	Respondents Answer					Average (of 5)
		VP	P	A	G	VG	
Components of Critical Thinking Ability	X2.1	1	6	33	35	10	3.55
Average (100%)		1.2%	7.1%	38.8%	41.2%	11.8%	

Table 8. Results of the Average Variable Components of Critical Thinking Ability

Variable	Question Items	Respondents Answer					Average (of 5)
		VP	P	A	G	VG	
Components of Critical Thinking Ability	X2.2	0	5	13	43	24	4.01
Average (100%)		0%	5.9%	15.3%	50.6%	28.2%	

Table 9. Results of the Average Variable Components of Critical Thinking Ability

Variable	Question Items	Respondents Answer					Average (of 5)
		VP	P	A	G	VG	
Components of Critical Thinking Ability	X2.3	0	16	35	27	7	3.29
Average (100%)		0%	18.8%	41.2%	31.8%	8.2%	

Table 10. Results of the Average Variable Components of Critical Thinking Ability

Variable	Question Items	Respondents Answer					Average (of 5)
		VP	P	A	G	VG	
Components of Critical Thinking Ability	X2.4	0	11	27	37	10	3.54
Average (100%)		0%	12.9%	31.8%	43.5%	11.8%	

Table 11. Results of the Average Variable Components of Critical Thinking Ability

Variable	Question Items	Respondents Answer					Average (of 5)
		VP	P	A	G	VG	
Components of Critical Thinking Ability	X2.5	0	7	34	34	10	3.55
Average (100%)		0%	8.2%	40.0%	40.0%	11.8%	

Table 12. Results of the Average Variable Components of Critical Thinking Ability

Variable	Question Items	Respondents Answer					Average (of 5)
		VP	P	A	G	VG	
Components of Critical Thinking Ability	X2.6	1	4	35	31	14	3.62
Average (100%)		1.2%	4.7%	41.2%	36.5%	16.5%	

From table 7 to 12 above, then a search process for the total average (mean) of the six questions is carried out using the mean formula [37]. Equation (1).

(1)

$$mean = \frac{3.55 + 4.01 + 3.29 + 3.54 + 3.55 + 3.55 + 3.62}{6}$$

$$mean = 3.593$$

So based on the calculation above, the result is 3.593, or enough on the Likert scale. This means that ChatGPT is quite influential in improving critical thinking skills. The results of this study have similarities with research conducted by [38] which stated that ChatGPT provides many benefits for students, such as providing information, and useful resources and helping to improve language skills, including grammar, vocabulary, and writing style. Likewise, research conducted by [39], [40], and [41] both show that ChatGPT has a good effect, especially in its use in education.

Conclusion

Based on the results of our research, it can be concluded that dependence on using ChatGPT has an unfavorable effect on the critical thinking skills of UIN Sunan Kalijaga students. This is consistent with data showing a decrease in critical thinking skills, before using ChatGPT by 3.52% and after using ChatGPT by 3.22%. Even so, ChatGPT has a positive influence on students' critical thinking skills based on the components proposed by Facione. Evidenced by the results of this study which showed a sufficient effect of 3.593. Students need to continue to develop critical thinking skills independently and use ChatGPT as a tool that needs to be evaluated critically. In the Education system, it is important to take proper steps in integrating ChatGPT to ensure that its use does not harm the learning process of students. With the right approach, ChatGPT can be an influential source of information in developing students' critical thinking skills.

Due to limited time and resources, the researcher suggests that future researchers conduct research on ChatGPT with issues that are currently being discussed using a larger number of samples and a wider range. Researchers also suggest to activists in the fields of education and technology to strive for ChatGPT integration to support the teaching and learning process.

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