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THE EFFECT OF THE USE OF CHATGPT ON THE CRITICAL THINKING SKILLS OF GRADE XI TKJ STUDENTS AT SMKN 1 BOYOLANGU

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Abstract*—The development of artificial intelligence (AI) has increasingly penetrated the field of education, notably through the use of ChatGPT as a learning support tool. This study aims to determine the effect of ChatGPT usage on the critical thinking skills of Grade XI students majoring in Computer and Network Engineering (TKJ) at SMKN 1 Boyolangu. Critical thinking is a vital skill in the information era, encompassing the ability to identify, evaluate, and make rational decisions. The integration of ChatGPT into learning is expected to stimulate the development of these skills through in-depth, text-based interactions. This research employs a quantitative approach with a quasi-experimental method, using a Non-Equivalent Control Group Design. The sample consisted of two classes, each with 35 students: one experimental group utilizing ChatGPT during the learning process and one control group not using it. Data was collected through a Likert-scale questionnaire measuring two main variables: the intensity of ChatGPT usage (independent variable) and students' critical thinking ability (dependent variable). The research instruments were tested for validity and reliability and were statistically proven to meet standard requirements. Data analysis using an independent t-test in SPSS version 25.0 revealed that both pre-test and post-test significance values were above the 0.05 threshold. This indicates that there was no significant difference in critical thinking ability between students who used ChatGPT and those who did not. Therefore, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. These findings suggest that using ChatGPT does not significantly impact students' critical thinking abilities. Although ChatGPT holds potential as a learning aid, its use alone may not directly enhance students' critical thinking without being accompanied by appropriate pedagogical strategies. Thus, integrating technologies like ChatGPT into educational settings must be carried out systematically and contextually to effectively support students' cognitive development. This study recommends that educators continue to guide students in verifying information and encourage critical analysis of AI-generated content.

Keywords— ChatGPT, critical thinking

I. INTRODUCTION

Currently, Indonesia's education system faces significant challenges, especially in the areas of critical thinking and student support. In the midst of the rapid development of information technology, the integration of artificial intelligence (AI) into the learning process has begun. One of the innovations that has emerged is the use of AI-based chatbots such as ChatGPT.[1]

Critical thinking skills are an important skill for prospective students., ChatGPT facilitates students to interact and ask questions about a variety of topics, and is expected to increase their level of criticism of the information received.[2]

From observations made by researchers at SMK Negeri 1 Boyolangu, 60% of students use ChatGPT to do assignments and almost all subjects and increase knowledge from ChatGPT that is not yet in the student companion book. However, there are 40% of students who still think critically in answering the questions given to teachers by searching for answers in ChatGPT and then matching them with questions or with materials that are already in the student companion book

II. RESEARCH METHODS

A. Types of Research

This study uses an experimental research method. The experimental method is a research method used to find the effect of certain treatments. There are several types of experimental research, but the researcher took one type of experiment, namely Design Quasi Experiment using the Non Equevalen Control Group Design research design form. This design was carried out to compare the results of the pree-test before being treated with the help of ChatGPT and the results of the post-test after being treated using the help of ChatGPT. In this study, the researcher did not test the cause-and-effect relationship between variables, but focused more on measuring, calculating, and describing data based on the findings. Quantitative correlation only shows the relationship between variables. The data obtained is analyzed using statistical techniques to present structured and objective information [3]

Eksperimen	O1	X	O2
Kontrol	O3	-	O4

This research design is a quasi-experimental research with a form of nonequivalent control group design involving two groups, one group as an experimental group and the other group as a control group. Quasi-experiments are characterized by having control groups, but they cannot fully function to control external variables that affect the conduct of experiments [4]. The following is figure 1 which is a quasi-experimental research with a nonequivalent control group design research design:

Figure 1 Research Design

X : Treatment, with the help of ChatGPT
O1 : Experimental class before treatment
O2 : Experimental class after treatment
O3 : Control class before treatment
O4 : Control class after treatment

B. Research Variables

Research variables are fundamental elements in quantitative research that function to measure and explain phenomena objectively. These variables represent characteristics or attributes that can be measured and indicate variations between individuals or objects studied. In quantitative research, variables are classified into independent variables (influence factors) and bound variables (influencing factors), and can include control and moderator variables to reduce bias and test for more complex relationships [5]. In this study, there are two variables, namely free and bound variables. The independent variable of this study is the use of Chat GPT and its bound variable, namely Critical thinking.

C. Population and Sample

In quantitative research, a population is defined as an overall unit of analysis that has specific characteristics and is the target of generalization of research findings. A sample is a part of a population that is systematically selected to represent the entire population, thus allowing researchers to draw conclusions by optimizing the use of time and resources [5]. One of the most widely applied non-probability sampling techniques is intended sampling, in which researchers select samples based on specific considerations or specific criteria that align with the research objectives [7]. This technique is especially appropriate when researchers need data from a specific group that has unique or important characteristics to answer the research question. Although it does not allow for broad generalizations, the purposive sampling method can improve the depth of analysis and data quality when applied systematically and transparently [7]

The population in this study is all students of class XI TKJ SMKN 01 Boyolangu 107 students. Samples were taken by purposive sampling, consisting of 35 students of class XI TKJ 1 (experiment) and 35 students of class XI TKJ 2 (control).

D. Data Collection Techniques

Data collection techniques are a crucial component in quantitative research to obtain valid and measurable information. There are three main methods that are often used, namely interviews, observations, and Likert scale questionnaires. Interviews allow researchers to dig into in-depth information related to participants' perceptions and experiences through direct interactions, making them effective in understanding individual values and beliefs (Monday, 2020). Meanwhile, observation provides an opportunity for researchers to witness behavior firsthand in its natural context, which can strengthen understanding of the actions being studied

The Likert scale questionnaire is an instrument that is widely used to measure respondents' attitudes or opinions through an ordinal scale ranging from strongly disagree to strongly agree. The questionnaire in this study used a likert scale to measure learning motivation based on 6 indicators from [8] namely the desire for success, the encouragement and need for learning, the existence of future hopes and ideals, appreciation in learning, interesting learning activities, and a fun learning environment for students to study well.

E. Data Analysis Techniques

1. Test Instruments

Instrument testing is a critical stage in quantitative research to ensure that measuring instruments are able to produce valid and consistent data. The validity test aims to evaluate the extent to which the instrument actually measures the intended construct. Commonly used approaches include content validity testing through expert assessment or empirical validity with Pearson Product Moment correlation analysis [9]

On the other hand, reliability tests measure the level of consistency of results obtained from instruments under similar measurement conditions. The most popular technique is Cronbach's Alpha, where the > 0.5 usually indicates adequate reliability [10]. High validity and reliability are the main prerequisites for the instrument to be suitable for reliable scientific decision-making.

2. Prerequisite Test

Prerequisite testing is a crucial initial stage in quantitative statistical analysis to verify the suitability of data with basic assumptions before hypothesis testing. The two main tests that are often carried out include normality and homogeneity tests. The normality test aims to examine the distribution of data, where the Kolmogorov-Smirnov test is commonly used as a tool to verify the normality of the distribution of the data before further analysis [11].

The homogeneity test serves to ensure uniformity of variance between the data groups being compared, with the Levene's Test being the commonly applied method of analysis. In practice, the Levene test is also used to verify the similarity of variance before the implementation of the t-test. The validity of the results of statistical analysis is largely determined by the fulfillment of these assumptions of normality and homogeneity, because violations of these two assumptions can result in biased or inaccurate conclusions [12].

3. Hypothesis Test:

Hypothesis testing in quantitative research aims to identify significant differences between groups. One of the most widely used methods of analysis is the independent sample t-test, a statistical technique for comparing the averages of two unrelated groups. The requirements for the application of this test include: (1) data are scaled intervals or ratios, (2) are normally distributed, and (3) have homogeneous variance [13]. Significant t-test results showed that the average difference between groups was not caused by a coincidence factor, but rather by the variables studied.

III. RESULTS AND DISCUSSION

This research was carried out at SMKN 1 Boyolangu in the even semester of the 2024/2025 school year. The population used is grade XI students majoring in Computer and Network Engineering (TKJ), currently totaling 70 students. There were two classes used as samples, namely class XI TKJ 1 as an experimental class and XI TKJ 2 as a control class, each of which consisted of 35 students. In collecting data, the influence of the use of chatGPT on the way of critical thinking of students using questionnaires through google form.

The questionnaire validity test stage is a phase to test the measurement of the results of 40 questions in the questionnaire that were tested on 68 respondents. The data from the results of the questionnaire is measured and tested for validity, whether it is valid or invalid. From this, 40 valid statements appear. This validity test stage uses the help of SPSS by comparing the significance value, if the significance is < 0.05 then it is declared valid, and if the significance is > 0.05 then it is declared invalid. Questionnaire for XI TKJ students after being analyzed using SPSS version 25 of the 40 questionnaire items, there were 40 questionnaire items that were declared valid.

Table I Reliability Test Results

Reliability Statistics

Cronbach's Alpha	N of Items
.948	20

Reliability Statistics

Cronbach's Alpha	N of Items
.958	20

Based on table I above, 20 statements using chat GPT and 20 critical thinking statements that have gone through validity tests get Alpha Cronbach values of 0.948 and 0.958 which are greater than 0.5. Then it can be declared reliable [10].

Table II Normality Test Results

Variabel	Sig
Pengaruh Penggunaan ChatGPT terhadap kemampuan berfikir kritis siswa.	0.243

The results of the normality test using the Kolmogorov-Smirnov method showed that the statistical test value was 0.084. In the Asymp column. Sig. (2-tailed), a significance value (p-value) of 0.200 with Lilliefors correction indicates that the residual distribution is normal at the significance level of 0.05 because the p-value is greater than 0.05. The residual distribution in this model does not deviate significantly from the normal distribution, so the assumption of normality is met. This supports the validity of the regression model in terms of residual distribution assumptions. Asymp value. The Sig. is 0.200 and the Monte Carlo Sig. is 0.243 > 0.05, which indicates that there is not enough evidence to reject the null (H_0) hypothesis, the residual distribution in this model does not deviate significantly from the normal distribution so that the normality assumption is met. This supports the validity of the regression model in terms of residual distribution assumptions. In the K-S test, it is stated that the residual distribution is normal because the significance value is greater than 0.05, then the residual can be considered as normal distribution..

Table III Homogeneity Test Results

Leave Statistic	**Sig**
Based On Mean	0.565
Based On Median	0.525

Variance homogeneity tests are needed before comparing two or more groups, so that the differences are not due to differences in basic data (inhomogeneity of the groups being compared [14]. The decision making of the homogeneity test is that if the significance is > 0.05, H0 is accepted (same variant) and if the significance is < 0.05, H0 is rejected (different variant). The following are the results of the homogeneity test.

In table III, the homogeneity test of sig values in all methods (Based on Mean, Based on Median, Based on Trimmed Mean) is 0.565, 0.525, 0.520, respectively. Since the three significance values are greater than 0.05, it can be concluded that the data tested came from populations that have the same or homogeneous variance. Thus, the homogeneity assumption in advanced statistical analysis has been met, so that the researcher can proceed to the next stage of analysis using parametric statistical methods such as t-tests or ANOVA

Table IV Hypothesis Test Results

Variabel	**Sig**
Penggunaan ChatGPT terhadap kemampuan berfikir kritis	0.973

Based on table IV, the significance value that has been calculated is 0.973. Where 0.973 > 0.05, H0 is accepted and H1 is rejected, so it can be concluded that there is no effect of the use of chat GPT on the critical thinking ability of students of XI TKJ SMKN 1 Boyolangu.

Based on the data analysis of the calculation of the hypothesis T test assisted by data processing software, namely SPSS version 25 for windows, it can be concluded that H0 is accepted and Ha is rejected where the T value of the pretest obtains a significance value of 0.973. Meanwhile, in the posttest T-value, the significance value was 0.973. Where 0.973 (> 0.05) indicates that there is no relationship between the influence of the use of chatGPT on the way of critical thinking of students in class XI TKJ SMKN 1 Boyolangu.

The results of this study are in accordance with the research [15]where the results of the study show that the use of ChatGPT has a diverse impact on students' critical thinking skills. Most respondents, at 43.4%, reported an increase in critical thinking skills after using ChatGPT. However, 41.5%

of respondents stated that the increase was very minimal, and 9.4% admitted that there was no change at all. Interestingly, 5.7% of respondents actually felt that their critical thinking skills decreased because they were too dependent on ChatGPT. These results show that while ChatGPT can be a useful tool in the learning process, it can also negatively impact the development of students' critical thinking skills.

In the journal [16], it is stated that ChatGPT has a bad impact and has no effect on critical thinking skills because of the potential risk if users rely too much on ChatGPT without a process of reflection or self-evaluation. This kind of dependence can hinder the development of critical thinking skills, creativity, and independent problem-solving skills. The use of ChatGPT without the ability to criticize or verify the information provided can also reduce students' evaluative abilities. The use of ChatGPT needs to be accompanied by critical thinking awareness so that it does not have a negative impact on the quality of students' thinking.

This is in line with Martin emphasizing that true critical thinking requires the process of questioning, testing assumptions, and building arguments independently, something that models like ChatGPT can't do. In the context of higher education, especially in liberal arts institutions, ChatGPT is seen as not directly contributing to the development of students' critical thinking skills, but only serves as a complement that still requires human intervention so that learning outcomes remain meaningful [17].

The above statement is reinforced by the article "Drivers and Consequences of ChatGPT Use in Higher Education" [18]which states that excessive use of ChatGPT can have a negative impact on students' critical thinking skills. The study highlights that reliance on ChatGPT has the potential to weaken the ability to analyze, evaluate, and solve problems independently. When students rely too much on instant answers from AI without reflecting or verifying information, this can reduce the habit of deep thinking that is essential in the learning process. In addition, there is the risk of receiving information that is not completely accurate from ChatGPT can also worsen the quality of students' reasoning and understanding if it is not criticized properly. It can be concluded that although ChatGPT offers convenience and efficiency, its use can still negatively impact the intellectual development of students.

CONCLUSION

Based on the results of research conducted on grade XI TKJ students at SMKN 1 Boyolangu, it can be concluded that the use of ChatGPT does not have a significant influence on students' critical thinking skills. This is shown by the results of the t-test which shows a significance value (p-value) greater than 0.05 in both the pre-test and post-test. Although ChatGPT is able to provide ease of access to information and complete tasks, its presence has not actually encouraged the improvement of students' critical thinking skills if it is not accompanied by the right guidance and learning strategies.

Students tend to use ChatGPT as a tool to obtain instant answers rather than as a medium for evaluating, analyzing, and critically reflecting on information. Some students show an understanding of matching information from ChatGPT with the material in the book, but most others still rely completely without a critical thinking process. Therefore, the positive potential of ChatGPT has not been optimally utilized in developing high-level cognitive abilities.

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