



Unveiling the Nexus: Critical Thinking and Academic Achievement in Grade XI at SMAN 3 Palopo

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ABSTRAK

Perkembangan teknologi informasi dan komunikasi menuntut pembelajar meningkatkan keterampilan berpikir kritis untuk menyaring informasi yang akurat, sehingga mencapai kebenaran dan pemahaman yang tepat tentang pengetahuan di sekitar mereka. Hal ini juga diharapkan dapat membantu meningkatkan hasil belajar siswa. Penelitian yang digunakan dalam studi ini adalah penelitian deskriptif kuantitatif dengan tujuan untuk menentukan hubungan antara keterampilan berpikir kritis dan hasil belajar siswa dalam biologi, khususnya dalam topik sistem pencernaan untuk Kelas XI. Subjek penelitian yang digunakan adalah seluruh siswa IPA Kelas XI di SMAN 3 Palopo. Penentuan subjek yang digunakan menggunakan rumus Slovin, yang menghasilkan ukuran sampel sebanyak 147 siswa. Teknik pengambilan sampel yang digunakan adalah purposive sampling. Pengumpulan data dalam penelitian menggunakan dua instrumen: tes keterampilan berpikir kritis yang terdiri dari 10 pertanyaan esai yang disesuaikan dengan indikator keterampilan berpikir kritis menurut Ennis dan tes hasil belajar yang terdiri dari 20 pertanyaan pilihan ganda yang disesuaikan dengan indikator dimensi kognitif taksonomi revisi Bloom menurut Anderson & Krathwohl. Data tentang keterampilan berpikir kritis dan hasil belajar siswa dianalisis secara deskriptif, dan tes prasyarat dilakukan menggunakan uji normalitas Kolmogorov-Smirnov dan uji linieritas sederhana. Hubungan antara keterampilan berpikir kritis dan hasil belajar siswa diuji menggunakan uji korelasi product-moment, dan hasil yang diperoleh menunjukkan hubungan yang sangat kuat dan positif antara keterampilan berpikir kritis dan hasil belajar. Penelitian ini diharapkan dapat memberikan wawasan kepada pendidik dalam upaya meningkatkan keterampilan berpikir kritis siswa.

Kata kunci: Korelasi, Keterampilan Berpikir Kritis, Hasil Belajar

ABSTRACT

The development of information and communication technology demands that learners enhance their critical thinking skills to filter accurate information, thereby achieving truth and a proper understanding of the knowledge around them. This is also expected to help improve students' learning outcomes. The research used in this study is quantitative descriptive research with the aim of determining the relationship between critical thinking skills and student learning outcomes in biology, specifically in the digestive system topic for Grade XI. The research subjects used were all Grade XI science students at SMAN 3 Palopo. The determination of the subjects used the Slovin formula, resulting in a sample size of 147 students. The sampling technique employed was purposive sampling. Data collection in the research utilized two instruments: a critical thinking skills test consisting of 10 essay questions adjusted to the critical thinking skill indicators according to Ennis and a learning outcomes test consisting of 20 multiple-choice questions adjusted to the cognitive dimension indicators of Bloom's revised taxonomy according to Anderson & Krathwohl. Data on critical thinking skills and student learning outcomes were analyzed descriptively, and prerequisite tests were conducted using the Kolmogorov-Smirnov normality test and simple linearity tests. The relationship between critical thinking skills and student learning outcomes was tested using the product-moment correlation test, and the results obtained indicate a very strong and positive relationship between critical thinking skills and learning outcomes. This research is expected to provide insight to educators in their efforts to enhance students' critical thinking skills.

Keywords: Correlation, Critical thinking, Learning outcomes

1. INTRODUCTION

Education plays a crucial role in enhancing human potential towards betterment, particularly in Indonesia, as an effort to develop the potential of individuals through activities and environments within education (Triwiyanto, 2014). The demand for developing each student's potential cannot be separated from the effort to enhance students' thinking skills. Thinking skills consist of four levels: memorization (recal thinking), basic thinking, critical thinking, and creative thinking. The learning competencies of the 21st century require the development of critical thinking skills for students as preparation to face various challenges occurring today (Jalinus & Krismadinata, 2020). Schools as educational institutions and teachers are guided to assist students in developing their potential, one of which is critical thinking skills to address surrounding issues, especially in balancing the rapid development of information and communication technology in the 21st century (Triwiyanto, 2014).

Biology education, as a part of science education, contains facts and principles derived from scientific studies that require problem-solving skills through critical thinking abilities (Surastina, et al., 2021). Critical thinking is considered a cognitive activity that correlates with reasoning or thought abilities (Purnomo, 2019). Individuals engaging in critical thinking need to consider each parameter based on supporting facts rather than emotions. Critical thinking skills serve as an indicator of intelligence for individuals because critical thinking requires flexible thinking efforts, enabling individuals to analyze evidence and relevant information to make informed decisions. Intelligence relies on logical understanding and knowledge gained through experience in decision-making. Therefore, critical thinking skills can influence the quality of conceptual understanding, particularly among students in learning activities (Triwulandari, 2022). Critical thinking can assess various fields of knowledge, particularly in psychology, to distinguish scientific knowledge from non-scientific knowledge (Saparuddin, et al., 2021).

Critical thinking differs from the cognitive dimension of Bloom's taxonomy, especially Higher Order Thinking Skills (HOTS), as they each have their respective indicators, although there are some interconnected similarities. The difference lies in the indicators: in critical thinking, students need to further argue by criticizing every issue from various procedural perspectives to obtain valid arguments. On the other hand, HOTS requires students to present arguments but in a non-procedural manner, and only through independent analysis and evaluation can they progress to the process of creative thinking (Susilowati & Sumaji, 2020). Assessment of critical thinking can refer to various indicators. One of the indicators proposed by Ennis includes: (1) providing simple explanations; (2) building basic skills; (3) drawing conclusions; (4) providing further explanations; (5) organizing strategies and tactics (Nahadi, et al., 2021).

Assessing students' competencies or abilities in learning activities can be determined through measuring learning outcomes (Hadiyanto, 2016). Learning outcomes represent the measurement of cognitive, psychomotor, and affective abilities acquired by individuals based on their educational institution activities or life experiences (Harefa & Telambanua, 2020). Cognitive learning outcomes are commonly used by teachers to assess students' cognitive abilities, such as reasoning. Assessment of cognitive learning outcomes can be conducted through tests covering abilities based on Bloom's taxonomy revision by Anderson & Kratwohl, adjusted for 21st-century education, which includes several levels of abilities: remembering (C1), understanding (C2), applying (C3), analyzing (C4), evaluating (C5), and creating (C6) (Rosana, 2019).

The development of critical thinking skills in learning aims to enhance students' learning outcomes (Harefa & Telambanua, 2020). Students' learning outcomes are influenced by internal and external factors. Internal factors may include intelligence level, attention, talent, interest, and learning motivation. External factors are influenced by the environment within the family, community, and school (Astiti, et al., 2021). Intelligence, as one of the internal factors, can affect students' learning outcomes because it correlates with an individual's ability to categorize and connect everything around them, thus high intelligence can lead to easy comprehension of concepts in learning and obtaining high learning outcomes (Octavia, 2021). Critical thinking, as an indicator of intelligence, affects the quality of students' conceptual understanding (Triwulandari, 2022). This indicates that critical thinking has a high potential in determining cognitive learning outcomes so that students can achieve optimal learning outcomes according to the given materials and learning objectives (Hallatu, et al., 2017).

Based on interviews with biology teachers at SMAN 3 Palopo, it was found that the implementation of biology learning has been quite successful, with most students achieving the Minimum Passing Grade (KKM). The learning process tends to use the jigsaw model with discussions interspersed with lectures to engage students more actively in the learning process. The conditions of biology learning at SMAN 3 relate to efforts to develop students' critical thinking skills, thus enabling most students to achieve the KKM. Research examining the relationship between critical thinking and learning outcomes shows that critical thinking skills are correlated with learning outcomes (Resti, 2016). Similar studies also indicate a relationship between these variables (Saparuddin, et al., 2021).

Based on the explanations provided, the objectives of this research are: (1) to describe the level of critical thinking skills of students in the digestive system material in class XI at SMAN 3 Palopo, (2) to describe the level of learning outcomes of students in the digestive system material in class XI at SMAN 3 Palopo, (3) to determine the relationship between critical thinking skills and learning outcomes of students in the digestive system material in class XI at SMAN 3 Palopo.

2. METHODS

The type of research conducted is quantitative research using a correlational ex-post facto research method. The population in this study is all students of class XI IPA at SMAN 3 Palopo for the academic year 2022/2023, totaling 210 students. The determination of the sample uses purposive sampling technique with the sample size adjusted using the Slovin formula, resulting in 147 student samples. Data collection technique utilizes instruments in the form of essay tests with indicators tailored according to Ennis to obtain data results from the variable of critical thinking skills, and multiple-choice tests with indicators tailored according to Anderson and Krathwol to obtain data results from the variable of learning outcomes. Validity tests are conducted through expert validity tests and empirical validity tests. The data obtained will be processed through descriptive analysis to draw conclusions regarding students' critical thinking skills and learning outcomes. The method used is scoring method by calculating scores for each question and obtaining the mean value of critical thinking skills data and learning outcomes data. Assessment of students' critical thinking skills and learning outcomes is categorized in the categorization of critical thinking skills and learning outcomes in Table 1 and Table 2.

Table 1. Categories of Students' Critical Thinking Skills

Score Interval	Category
85-100	Excellent
75-84	Good
60-74	Fair
40-59	Low
0-39	Very Low

Table 2. Categories of Students' Learning Outcomes

Score Interval	Category
86-100	Excellent
71-85	Good
56-70	Fair
41-55	Low
0-40	Very Low

Before conducting hypothesis testing, data prerequisites need to be examined. In this case, the Kolmogorov-Smirnov normality test and simple linearity test have been performed to ensure that the data meet the required statistical assumptions. After ensuring that the data meet the assumptions, hypothesis analysis can proceed. To test the relationship between critical thinking skills and student learning outcomes, the product moment correlation test is used.

The critical thinking skill indicators used refer to the framework provided by Ennis, which includes providing simple explanations, building basic skills, drawing conclusions, providing further explanations, and organizing strategies and tactics (Nahadi, et al., 2021).

Meanwhile, the indicators used to determine student learning outcomes are based on the cognitive dimension of Bloom's taxonomy revision according to Anderson & Krathwohl, which include remembering (C1), understanding (C2), applying (C3), and analyzing (C4) (Rosana, 2019). By using the product moment correlation test, we can determine the strength or weakness of the relationship between critical thinking skills and student learning outcomes.

3. RESULTS AND DISCUSSION

Based on the research conducted in class XI of SMAN 3 Palopo, the results of descriptive analysis of critical thinking skills data are presented in Tables 3, 4, and 5 as follows.

Table 3. Descriptive Statistical Analysis of Critical Thinking Skill Scores

Statistic	Statistic Value
Number of Samples	147
Mean	75,27
Minimum Value	55,00
Maksimum Value	95,00
Variance	75,10
Standard Deviation	8,67

Table 3 illustrates that the research comprises data on critical thinking skills outcomes, with a mean value of 75.27 and a standard deviation of 8.67. A standard deviation value smaller than the mean indicates that the critical thinking skills variable has homogeneous data

Table 4. Descriptive Statistical Analysis of Critical Thinking Skill Scores

Score Interval	Frequency	Percentage	Category
85-100	23	15,65%	Excellent
75-84	62	42,18%	Good
60-74	58	39,45%	Fair
40-59	4	2,72%	Low
0-39	0	0%	Very Low

Table 4 illustrates that the percentage of critical thinking skills among students at SMAN 3 Palopo shows that overall, students with the highest percentage are in the good category (42.18%), while the lowest percentage is in the low category (2.72%), and there are no students in the very low category (0%).

Table 5. Average Scores for Each Critical Thinking Indicator

No.	Critical Thinking Skill Indicators	Mean	Category
1.	Providing simple explanations	73,47	Fair
2.	Building basic skills	76,96	Good
3.	Drawing conclusions	74,91	Good
4.	Providing further explanations	73,89	Fair
5.	Organizing strategies and tactics	77,13	Good

Table 5 presents the average scores for each critical thinking skills indicator obtained from the data collected from students in class XI at SMAN 3 Palopo. The critical thinking skills indicator with the highest average score is organizing strategies and tactics, while providing simple explanations is the indicator with the lowest average score. The distribution of data from the analysis obtained for the average of each indicator can be seen in the following diagram

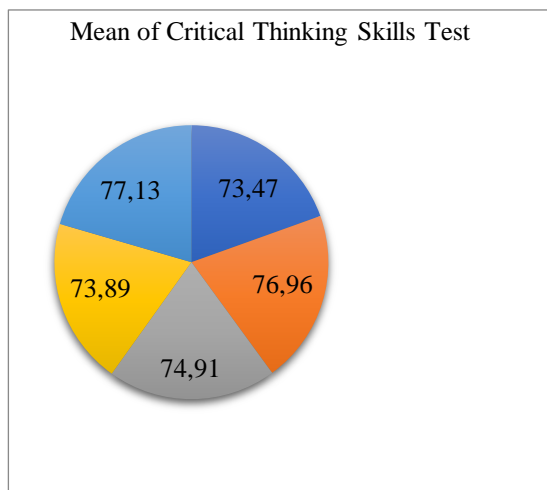


Figure 1. Average Scores of Critical Thinking Skills for Each Indicator

Chart 1 illustrates the critical thinking skills indicators. The indicator of organizing strategies and tactics has the highest average score of 77.13, falling into the 'good' category. Meanwhile, the lowest average score for critical thinking skills is found in the indicator of providing simple explanations, with a score of 73.47, categorized as 'sufficient.' Based on the research results in class XI at SMAN 3 Palopo, the analysis of learning outcomes data is presented in Table 6, Table 7, and Table 8 as follows.

Table 6. Descriptive Statistical Analysis of Cognitive Learning Outcome Scores

Statistic	Statistical Values
Number of Samples	147
Mean	78,06
Minimum Value	45,00
Maksimum Value	100,00
Variance	92,28
Standard Deviation	9,61

Table 6 displays the research data on learning outcomes, with a mean value of 78.06 and a standard deviation of 9.61. A standard deviation smaller than the mean indicates that the data for the cognitive learning outcome variable is homogeneous.

Table 7. Descriptive Statistical Analysis of Learning Outcomes Scores

Score Interval	Frequency	Percentage	Category
85-100	28	19,05%	Excellent
75-84	73	49,66%	Good
60-74	41	27,89%	Fair
40-59	2	1,36%	Low
0-39	0	0%	Very Low

Table 7 indicates that the percentage of student learning outcomes at SMAN 3 Palopo, overall, shows that students with high percentages are in the good category (49.66%), while the lowest percentage is in the low category (1.36%), and there are no students in the very low category (0%).

Table 8. Average Scores for Each Critical Thinking Indicator

No.	Cognitive Learning Outcome Indicators	Mean	Category
1.	Recalling	78,23	Good
2.	Understanding	79,05	Good
3.	Applying	77,96	Good
4.	Analyzing	77,01	Good

Table 8 shows the average scores for each learning outcome indicator obtained from the data collected from students in class XI at SMAN 3 Palopo. The learning outcome indicator with the highest average score

is understanding, while analysis is the indicator with the lowest average score. The distribution of data from the analysis obtained for the average of each indicator can be seen in the following diagram:

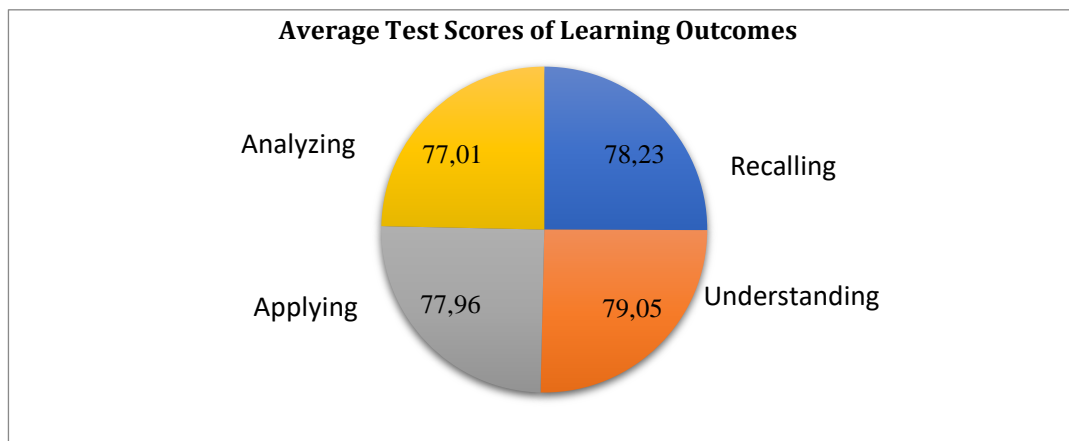


Figure 2. Average Scores of Learning Outcomes for Each Indicator

The research data obtained also underwent prerequisite tests using normality and linearity tests. Normality testing was conducted using the Kolmogorov-Smirnov test with SPSS 25.0 software. If the significance obtained is >0.05 , it indicates that the data are normally distributed, whereas data that are not normally distributed will have a significance value <0.05 . Linearity testing was conducted to determine the linear relationship between the two variables. If the significance value obtained is >0.05 , it indicates a linear relationship between the two variables, whereas if the significance value obtained is <0.05 , it indicates that the two variables do not have a linear relationship. The results of the normality and linearity tests are presented in Table 9 and Table 10.

Table 9. Normality Test Results

One-Sample Kolmogorov-Smirnov Test		
	Keterampilan Berpikir Kritis	Hasil Belajar
N	147	147
Exact Sig. (2-tailed)	,480	,060

Table 9 shows the results of the normality test. The significance value obtained for the normality test of critical thinking skills of students in class XI at SMAN 3 Palopo is $0.480 > 0.05$, and for the significance value of the learning outcomes of students in class XI at SMAN 3 Palopo is $0.060 > 0.05$. The results of the normality test for the data of the two variables under study, namely critical thinking skills and student learning outcomes, yielded significance values greater than 0.05, indicating that the data from the two sample variables are normally distributed.

Table 10. Linearity Test Results

ANOVA Table					
	Sum of Squares	df	Mean Square	F	Sig.
Deviation from Linearity	235,497	15	15,700	1,353	,180

Table 10 shows the results of the linearity test, which yielded a significance value of $0.180 > 0.05$ for the data on critical thinking skills and student learning outcomes in class XI at SMAN 3 Palopo. This result indicates that there is a linear relationship between the critical thinking skills and student learning outcomes. The research data, which have met the prerequisites, will undergo hypothesis testing analysis. The hypothesis testing utilizes the product moment correlation test to determine the relationship between two variables under investigation: critical thinking skills and student learning outcomes in class XI IPA at SMAN 3 Palopo.

The Pearson correlation coefficient obtained a value of 0.933, which is positive, indicating a direct relationship between the two variables, namely critical thinking skills and student learning outcomes. This direct relationship suggests that as students' critical thinking skills increase, their learning outcomes also improve, and vice versa. With a Pearson correlation coefficient of $r = 0.933$, the value falls within the range of 0.81-1.00, indicating a very strong correlation, according to Sugiyono (2019). Therefore, there is a very strong relationship between the two variables under study. Additionally, the significance value of the correlation test is 0.000, indicating a significant relationship between critical thinking skills and student learning outcomes in class XI at SMAN 3 Palopo.

The research data on students' critical thinking skills indicate that the majority of students exhibit good critical thinking skills. These skills are influenced by the teaching strategies employed by biology teachers (Kurniawan, et al., 2019). Biology teachers at SMAN Palopo tend to employ the jigsaw model through discussion methods, allowing students to be more active in the learning process. However, the results also indicate that some students have low levels of critical thinking skills. This may be attributed to teaching methods that focus mainly on lecturing, teachers' insufficient understanding and delivery of material to students, and limited learning resources through textbooks (Sarwanto & Chumdari, 2021). This discrepancy is because the implementation of the jigsaw model and discussion methods is not optimal due to some lessons being delivered through lecturing. Students' literacy skills and interests also play a significant role in acquiring extensive and relevant information for learning beyond the classroom (Susanti & Krisdiana, 2021).

The research data concerning students' cognitive learning outcomes indicate that the majority of students achieve good cognitive learning outcomes. Based on interviews conducted, this result is influenced by the teaching process implemented by biology teachers, which emphasizes a student-centered approach through the jigsaw model and discussion methods, leading to good learning outcomes for most students. Appropriate teaching models need to be used because effective learning can assist students in achieving good learning outcomes (Rosdianto, et al., 2020). However, despite the majority of students achieving good cognitive learning outcomes, some students still attain relatively low or insufficient results. This can be attributed to various other important factors that may affect cognitive learning outcomes, such as interest, motivation, attitude, intelligence ability, environment, learning strategies, and others. Furthermore, students have their unique learning styles, especially in understanding the concepts of learning materials. These differences in learning styles require teachers not to be solely focused on one teaching model, particularly student-centered ones (Rijal & Bachtiar, 2015). Choosing various appropriate teaching methods and models will create enjoyable learning conditions to enhance students' understanding during the learning process (Asiyah, et al., 2021).

The analysis of data through hypothesis testing regarding the relationship between critical thinking skills and student learning outcomes in class XI at SMAN 3 Palopo indicates a significant relationship between these two variables. This result is consistent with similar research conducted by Resti, which demonstrated a relationship between critical thinking skills and student learning outcomes with a correlation coefficient of 0.912 (Resti, 2016). Similarly, research by Saparuddin et al. also showed a very strong relationship between critical thinking skills and student learning outcomes with a correlation coefficient of 0.765 (Saparuddin, et al., 2021).

The hypothesis testing results indicating a relationship between critical thinking skills and student learning outcomes align with the views of Harefa & Taleumbanua that critical thinking skills can lead to improved student learning outcomes (Harefa & Taleumbanua, 2020). Critical thinking skills are one of the indicators of intelligence for every individual (Triwulandari, 2022). Intelligence is one of the internal factors influencing learning outcomes (Astuti, 2021). With high intelligence ability, students may find learning easier and achieve higher learning outcomes. Therefore, efforts to develop critical thinking skills are needed to improve students' learning outcomes

4. CONCLUSION

Based on the results of the data analysis and discussions presented, several conclusions can be drawn. Firstly, the critical thinking skills of students in class XI at SMAN 3 Palopo are categorized as good. Secondly, the learning outcomes of students in class XI at SMAN 3 Palopo are also categorized as good. Thirdly, there is a significant positive relationship between critical thinking skills and student learning outcomes

regarding the digestive system material in class XI at SMAN 3 Palopo. To improve student learning outcomes, it is suggested that SMAN 3 Palopo implement teaching methods that enhance students' critical thinking skills by developing various student-centered learning models. This will enable each student, with their unique characteristics, to develop their potential comprehensively, particularly in enhancing their critical thinking skills.

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