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ANALYSIS OF THE CRITICAL THINKING SKILLS OF CLASS X SMK STUDENTS IN BANDUNG CITY

Raisya Silvi Abdul Karim[1*], Elah Nurlaelah[2]

[1,2] Universitas Pendidikan Indonesia, Bandung, Indonesia
**Corresponding author.*
E-mail: raisyasilviabdulkarim@upi.edu [1)]*

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Abstract

This research was conducted because the research has not been found that analyzes critical thinking abilities based on indicators adopted from Joko D.P in the context of vocational students. The ability to think critically itself is not to solve complex problems with a variety of algorithms but designing a new algorithm from a new situation. . Critical thinking skills are also useful in life because the sharper ability to think critically students, the better the ability of students to solve problems. This study aims to describe the results of the analysis of the critical thinking ability of students in class X SMK in Bandung in solving the problem of the two -variable linear equation system. This research is a qualitative descriptive study. The sample of this study was 6 students of class X at SMK Dhyana Sakti Bandung. This research instrument consists of 5 questions about critical thinking abilities, interview and documentation guidelines. Data collection techniques used are through the stages of data reduction, data presentation and drawing conclusions. The results showed that students' critical thinking skills are still low, especially in question number 5 which has an indicator of evaluating and considering a trusted source or argument. It was concluded that this was caused by 1). Students have difficulty identifying important information from the story of the two -variable linear equation system 2). Students have difficulty making their mathematical models so students are unable to solve problems..

Keywords: a system of two-variable linear equations, critical thinking skills

Abstrak

Penelitian ini dilakukan karena belum ditemukannya penelitian yang menganalisis kemampuan berpikir kritis berdasarkan indikator yang diadopsi dari Joko D.P pada konteks siswa SMK. Kemampuan berpikir kritis sendiri bukanlah menyelesaikan persoalan yang kompleks dengan berbagai macam algoritma tetapi merancang algoritma baru dari situasi yang baru. Keterampilan berpikir kritis berguna dalam kehidupan karena semakin tajam kemampuan berpikir kritis maka semakin baik kemampuan siswa dalam memecahkan masalah. Penelitian ini bertujuan untuk mendeskripsikan hasil analisis kemampuan berpikir kritis siswa kelas X SMK di Kota Bandung dalam menyelesaikan soal sistem persamaan linear dua variabel. Penelitian ini merupakan penelitian deskriptif kualitatif. Sampel dari penelitian ini adalah 6 orang siswa kelas X di SMK Dhyana Sakti Bandung. Instrumen penelitian ini terdiri dari soal tes kemampuan berpikir kritis sebanyak 5 soal, pedoman wawancara dan dokumentasi. Teknik pengumpulan data yang digunakan yaitu melalui tahapan reduksi data, penyajian data dan penarikan kesimpulan . Hasil penelitian menunjukan bahwa kemampuan berpikir kritis siswa masih rendah khususnya pada soal nomor 5 yang memiliki indikator yakni mengevaluasi dan mempertimbangkan sumber terpercaya atau argumen . hal tersebut disebabkan oleh 1). Siswa kesulitan mengidentifikasi informasi penting dari soal cerita sistem persamaan linear dua variabel 2). Siswa kesulitan membuat model matematikanya sehingga siswa tidak mampu menyelesaikan soal.

***Kata Kunci** : kemampuan berpikir kritis, sistem persamaan linear dua variabel*

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INTRODUCTION

The curriculum that is currently being implemented in Indonesia is the independent curriculum, and the goals of the independent curriculum based on the decision of the ministry of education, culture, research, and technology of the Republic of Indonesia in 2022 is "Profil Pelajar Pancasila" (Ministry of Education and Culture, 2022). It consists of six dimensions, and one of the six dimensions is critical thinking. The goal of the independent curriculum is in line with the demands of the times and the pressures of globalization, where students are expected to have 21st-century skills, one of which is the ability to think critically (Kereluik et al., 2013). Therefore, students in Indonesia need to have critical thinking skills and are expected to make critical thinking a part of life skills that must be mastered.

Critical thinking skills are crucial in solving everyday problems because making the best decisions requires critical thinking. In addition, the sharper the students' critical thinking skills, the better the students' ability to solve problems in life (Su et al., 2016). According to Fisher, critical thinking skills can help stimulate students' intellectual abilities and can make them more active while studying in class (Chukwuyenum, 2013)

But in fact, students' critical thinking skills in Indonesia still need to improve Research conducted by Kempirmase et al., (2019) shows that critical thinking skills are still lacking where students find it difficult to analyse and develop problems. Research conducted by Fatmawati et al., (2014) also showed the same results that 72.2% of students were at the level of critical thinking level 1, namely students only limited to understanding the problem, meaning that students were still having difficulty in planning the idea of resolution and implementing the completion ideas. In addition, the research of Hafni et al., (2019) found that one of the schools in Medan has a low critical thinking ability, especially in indicators to investigate the truth of an argument, statement and process of solutions, identify relevant and irrelevant data in mathematical problems and analyse inference of a problem. From previous studies it is recommended for further research in order to conduct in-depth analysis related to mathematical critical thinking indicators based on contextual questions, open questions and adjust to students' initial knowledge

To follow up on previous research and as far as searching in the research that has been conducted, no research has been found that analyzes critical thinking abilities based on indicators adopted from Joko D.P in the context of vocational students in the city of Bandung. Therefore this research is expected to analyze regarding the mistakes of class X SMK students in solving critical thinking skills questions to improve students' critical thinking skills. The purpose of this study was to describe the results of the analysis of the critical thinking skills of class X SMK students in solving a system of two-variable linear equation problems

RESEARCH METHODS

This type of research is descriptive qualitative. The definition of descriptive qualitative itself is research whose data analysis is carried out qualitatively and then described descriptively. This research aims to analyze the mistakes of class X SMK students in working on critical thinking questions on the material system of two-variable linear equations. The indicators

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used are adopted from questions made by Joko D.P. (Hendriana et al., 2017) as shown in Table 1.

Table 1. Indicators of critical thinking skills

Indicator	Sub-Indicator	Points
Interpre-tation	Answer questions with relevant reasons	20
Analysis	Checking the correctness of a statement or process	10
Analysis	Check the correctness of the results (solutions) accompanied by an explanation	20
Evaluation	Analyze and clarify questions, answers, and arguments	25
Inference	Evaluate and consider reliable sources or arguments	25

This research was conducted in October 2022 at the Dhyana Sakti Vocational School, Bandung. This study took a sample of six students from class X majoring in business management with details of two students with high abilities, two students with moderate abilities and two students with low abilities based on the midterm exam reports. Then students will be classified based on the level of high critical thinking ability, moderate critical thinking ability and low critical thinking ability. To find out the percentage of students' thinking ability for each item, the following formula (1) is used (Abidin & Purbawanto, 2015).

$$P = \frac{T}{S \times N} \times 100\% \qquad (1)$$

Information

P: The percentage score of each stage of each item

T: Total score of each indicator for each item

S: Maximum score of each indicator for each item

N: Many subjects

The results of the above calculations form the basis for determining the category of students' critical thinking skills. Qualifications for students' critical thinking skills are determined by referring to the classifications made by Arikunto (Wijayanti & Azis, 2015), as shown in the Table 2.

Table 2. Category of students' critical thinking skills

Students' Critical Thinking Ability Score Interval	Category
80-100	Very high
66-79	High
56-65	Moderate
40-55	Low
≤39	Very low

Based on table 2, if students are included in the high thinking ability category, it means that students master all indicators of critical thinking well and if students are included in the low thinking ability category, it means that students do not master the critical thinking indicators. This research instrument consists of 5 questions about critical thinking abilities, interview and documentation guidelines. Data collection techniques used are through the stages of data reduction, data presentation and drawing conclusions. After obtaining the scores from the critical thinking skills test, students will be interviewed to find out students' reasons if students make mistakes in answering questions. This reason becomes the basis for logically drawing conclusions from the high and low levels of students' critical thinking skills

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RESULT AND DISCUSSION

This research was conducted on 6 students of class X majoring in business administration by providing 5 test questions previously validated by being tried out by other class students. The data on the percentage of students' critical thinking abilities were obtained from work done by the students. For more details, the following results in table 3 are obtained from tests of students' critical thinking skills, which are processed using *Microsoft Excel 2010*.

Table 3. Results of critical thinking skills

Num	Indicator	Number of Question	Correct answer		Incorrect Answers		No answer		Percentage of Student Scores Per Question Item (%)	Category
			N	%	N	%	N	%		
1	Answer questions with relevant reasons	1	4	66,67	2	33,33	0	0	75	High
2	Checking the correctness of a statement or process	2	3	50	3	50	0	0	65	Moderate
3	Check the correctness of the results (solutions) accompanied by an explanation	3	2	33,33	2	33,33	2	33,33	41.67	Low
4	Analyze and clarify questions, answers, and arguments	4	2	33,33	1	16,67	3	50	46,67	Low
5	Evaluate and consider reliable sources or arguments	5	1	16,67	2	33,33	3	50	16,67	Very low

As shown in the table 3, question number one is included in the highly critical thinking skills category, meaning that students have no difficulty working on the problem. In question number 1, students are asked to look for the value of the x dan y variable from a system of two-variable linear equations accompanied by relevant reasons. When viewed from student answers on the answer sheets and student answers when interviewed, it can be seen that students have been able to answer questions and their reasons well. Two students only made mistakes because both saw the questions wrong and miscalculated, not because they needed help answering the questions, so it can be concluded that students have mastered the first indicator in critical thinking skills, namely answering questions accompanied by relevant reasons.

In question number 2, included in the category of moderate critical thinking ability, students stated that the value of variable y is given in the question. Students are asked to state expres their opinion whether they agree or not. From the students' answers on

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the answer sheets, all students completed them well. Still, the mistakes that occurred to the three students were the absence of their opinions and only writing whether they agreed or disagreed with the statements on the questions. When interviewed, the three students said that because the value of variable y was already known, they only put (substitution) the values into one of the equations. Clearly, the statement in the question was wrong, so they felt no need to explain it. From these students' answers, it can be concluded that they do not experience difficulties in working on questions or have mastered the second indicator in critical thinking skills, namely checking the truth of a statement or process.

Students' critical thinking ability in question number 3 is included in the low category, meaning that most students need help working on the questions. In question number 3, students are given two values of variable x and two values of variable y . They are asked for their opinion, which is the set of solutions to the two-variable linear equation system problem given. From the student answer sheets, there are variations in the points that students get due to different mistakes made by students.

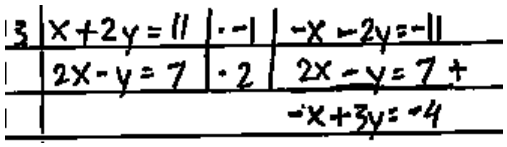

Figure 1. The student who gets 0 points

As shown in figure 1, students get 0 points because students are unable to solve the problem. When interviewed, students said they were confused about solving the problem because one of the equations was addition and one was subtraction, so they were confused when doing elimination. They had to be eliminated by subtracting or adding.

For the students who get 5 points because they only answer the correct answer without explaining how to get these answers or explaining their opinions. When interviewed, students said that because the questions asked for views made it difficult for students to express their opinions in words, students had difficulty changing explanations of their mathematical calculations into sentences, so students preferred to write down their answers.

From question number 3, it can be concluded that students have not mastered the third critical thinking ability indicator, namely checking the correctness of the results accompanied by explanations. The mistakes made by students in question number 3 were those who could not solve the problem because they needed to learn how and had difficulty expressing their opinions. This error is in line with research conducted by Saputri et al. (2019), namely the low ability to think critically is characterized by problems that arise, including(1) Inaccurate in analyzing a problem; (2) It is difficult doing high-level questions (C4-C6); (3) Passive when doing group work; (4) It is challenging to connect concepts and problems; (5) It isn't easy to express his opinion in discussions.

For question number 4, students are given a contextual question regarding a system of linear equations with two variables. Then students are asked to find the price of an *X* item and also the price of a *Y* item and then conclude whether the amount of money stated in the problem is enough to be able to buy the items. Question number

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4 is included in the low thinking ability category, meaning that students still have difficulty working on the questions. This was also evident from the results of the students' answers; only three answered the questions, while the other three did not answer the questions or left their answers blank. When asked about the three students who did not answer, they said that because the questions were long, they already felt confused when reading the questions and were also confused about answering them. For the three students who answered the questions, all three could respond well, but one student made a mistake when calculating, so the points obtained were only 20 points. This is in line with the research conducted by Fitriatien (2019), which showed that one of the mistakes students made in solving word problems was an error in understanding the problem, namely the inability of students to find out what is known in the problem and what is asked in the problem. From question number 4, it can be concluded that students have not mastered the fourth indicator: analyzing and clarifying questions, answers, and arguments.

Furthermore, for question number 5, the percentage of students' scores was 16.67%, with a very low category, meaning that students still needed help working on the questions. For the six students, only three answered the questions, while three still needed to answer the questions. In the fifth question, students are asked to evaluate the problem and then explain their arguments. From the results of interviews with the three students who answered, they said that they did not understand the meaning of the questions, did not know what information was in the questions, and did not know what formula to use because they could not make a mathematical model. Hence, students chose not to answer the questions.

For the other three students who answered the questions, only one responded correctly with 25 points, while two others answered incorrectly namely the student only stated how many people walked in the park but needed to include reasons why he answered ten people. When interviewed, the student said he was only guessing but needed to know the method he should use to answer the question correctly because he needed help understanding what mathematical model he could get from the problem. For the other student who answered incorrectly because he stated that the data listed in the question needed to be more sufficient, even though the data displayed in the question was adequate when to read carefully. This proves that students still need to provide important information about the problem. At the time of the interview, students said that usually, the questions displayed had the value of each variable (coefficient) listed so that answers could be obtained, whereas this was not in question number 5. Hence, students decided that the data in the problem still needed to be improved.

From question number 5, it can be concluded that students' critical thinking skills, especially in evaluating indicators and considering reliable sources or arguments, still need to improve. This is in line with research conducted by Junaidi (2017) ; Danaryanti & Lestari (2018)) regarding mathematical critical thinking skills, which also show that students have difficulty analyzing the information provided and concluding the solutions obtained. These results are further reinforced by research by Kharisma,

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(2018), which shows that students experience difficulties providing relevant explanations, evaluating answers, and applying the mathematical concepts they have learned.

CONCLUSION AND SUGGESTION

The results showed that students' critical thinking skills were still low, especially in question number 5, which had indicators of evaluating and considering reliable sources or arguments. From the analysis results, it was concluded that this was caused by 1). Students need help identifying important 2). Students need help making mathematical models, so students are unable to solve problems.

Suggestions for further research are to be able to develop test instruments that are tested on students with different materials so that they can better know how the students' critical thinking skills are. In addition, it is important for teachers to increase practice questions with routine and non-routine questions to get students used to solving problems

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