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EXAMINING STUDENTS' CRITICAL THINKING SKILLS IN ADDRESSING CONTEXTUAL MATRIX PROBLEMS WITHIN THE TOURISM TRAVEL PLANNING CONTEXT

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Info article

Abstract

The primary aim of this study is to provide an in-depth exploration of the critical thinking abilities exhibited by students when they are confronted with problem-solving tasks involving contextual matrices within the domain of Tourism Travel Planning and Management. To achieve this objective, the qualitative descriptive method is employed, involving a cohort of 30 students from the XI grade of Dirgantara Putra Bangsa Vocational High School as the research participants. The research methodology encompasses the utilization of research tools, including critical thinking skills assessment sheets and interview guidelines. The analysis of the gathered data reveals significant insights: 1) the focus indicator highlights a critical thinking ability percentage of 43.33%; 2) the reason indicator showcases a percentage of 35.00%; 3) the inference indicator indicates a percentage of 46.66%; 4) the situation indicator demonstrates a percentage of 61.11%; 5) the clarity indicator registers a percentage of 40.83%; and 6) the overview indicator presents a percentage of 31.66%. In summary, the average percentage of students' critical thinking skills is calculated to be 43.09%, placing it within the low-level category.

INTRODUCTION

The educational landscape of the 21st century undergoes a fundamental shift, placing learners at the core of the learning process (Meyer & Norman, 2020). This modern curriculum goes beyond traditional approaches, emphasizing detailed learning objectives, particularly in enhancing critical thinking skills, which are essential components of the entire educational journey (Muthmainnah et al., 2022; Salvetti et al., 2023). Critical thinking skills, as outlined by Trunk et al. (2020) and Siswanto & Peni (2023), encompass analysis,

evaluation, synthesis, and the application of information to solve problems, forming a vital foundation for making informed decisions in various contexts.

In the realm of mathematics education, critical thinking skills are pivotal in formulating and resolving solutions (Almulla, 2023; Minarti et al., 2023). Thus, the significance of learners' roles in advancing critical thinking abilities is underscored in the aforementioned discussions. These skills are not confined to the academic setting; they also play a crucial role in addressing real-world challenges or contextual (Tomlin et al., 2021). The implementation of rigorous teaching methodologies, particularly in mathematics, can enhance students' critical thinking skills (Lestiana et al., 2022).

Critical thinking proficiency is indispensable for navigating diverse situations in daily life (Sari & Juandi, 2023). It empowers students to confront challenges, whether simple or complex, by enabling them to discern truth amidst the information they encounter regularly (Rahiem, 2020). Defined as the capacity to make decisions through interpretation, analysis, evaluation, and inference, critical thinking also involves constructing arguments based on criteria, concepts, evidence, methodology, and contextual considerations (Siswanto et al., 2024). Thus, critical thinking is not merely an inherent intellectual potential but a skill acquired within the context of mathematics education.

The cultivation of critical thinking skills can be facilitated through the adoption of effective mathematics teaching methods (Gusmayenti, 2021). Mubarak et al. (2020) assert that mathematics instruction is structured to encourage students to apply critical thinking skills when tackling mathematical problems. This perspective aligns with Dolapcioglu & Doğanay (2022) suggestion that critical thinking skills should be an integral component of the mathematics curriculum, fostering students' learning. By integrating critical thinking skills, students can enhance their performance, justify their reasoning, comprehend logical connections between ideas, and systematically solve problems.

Matrices, a fundamental topic in mathematics education, offer opportunities to develop critical thinking skills (Jamil et al., 2024). According to Feriyanto & Putri (2020), teaching matrices aims to equip students with critical thinking abilities, problem-solving skills, and higher-order thinking capabilities in mathematics. Therefore, matrix learning serves as a platform for nurturing students' critical thinking skills. Although mastering critical thinking is challenging, it can be achieved through practice and learning (Alam et al., 2023; Jaswal & Behera, 2024; Tan et al., 2023). Consequently, educators should employ teaching methods that encourage students to think critically (Mu'minah & Suryaningsih, 2020) . Learning experiences should engage students in exercises that refine their critical thinking abilities, ensuring they graduate with proficient critical thinking skills.

However, several obstacles hinder the development of critical thinking skills. These obstacles, including insufficient practice, limited learning resources, biased perceptions, and time constraints, hinder the promotion of critical thinking Sarnita & Andaryani (2023). Additionally, factors like excessive memorization, lack of conceptual understanding, insufficient practice, and limited time can inhibit critical thinking skills (Anisa et al., 2021). Hence, it is reasonable for individuals to have lower critical thinking skills considering these challenges. This research endeavors to describe the critical thinking skills of XI grade students at Dirgantara Putra Bangsa Vocational High School in Tourism Travel Planning contextual matrix problem-solving tasks using critical thinking indicators such as focus, reason, inference, situation, clarity, and overview (Ennis, 1993).

RESEARCH METHODS

This research adopts a descriptive qualitative approach, employing a simple random sampling technique to select the trial sample. Its primary objective is to examine the critical thinking skills of XI grade students at Dirgantara Putra Bangsa Vocational High School when they tackle mathematical problems, particularly focusing on matrices within the context of Tourism Travel Planning. Following Sugiyono (2019) framework, the research utilizes a qualitative descriptive method to present the collected data, avoiding analytical generalizations or overarching conclusions.

The research utilizes critical thinking skills assessment sheets and interview guidelines as its tools. These assessment sheets contain descriptive questions tailored for students to respond to, while interviews, conducted semi-structuredly in line with Damayanti & Mayangsari (2017) perspective, aim to offer clarity and deeper insight into students' thought processes and explore emerging issues. Data analysis methods draw from adaptations of (Ennis, 1993), encompassing six FRISCO indicators of critical thinking abilities. Scoring follows the categories outlined by Karim & Normaya (2015), involving the distribution of critical thinking skills assessment sheets to randomly selected samples and evaluating students' responses to gauge their critical thinking ability. Through purposive sampling, several students encountering difficulties or failing to meet critical thinking ability stages or indicators are chosen for further scrutiny, with semi-structured interviews conducted to delve into their perspectives on the given problems and the challenges encountered during the problem-solving process.

RESEARCH RESULTS AND DISCUSSION

The test results and students' critical thinking ability indicators are illustrated in the following Table 1.

Table 1. Percentage of Each Critical Thinking Indicator

Critical Thinking Indicator	Percentage
Focus	43,33%
Reason	35,00%
Inference	46,66%
Situation	61,11%
Clarity	40,83%
Overview	31,66%

Based on the information provided in the aforementioned table, it is evident that: 1) the focus indicator reflects a critical thinking ability percentage of 43.33%; 2) the reason indicator shows a percentage of 35.00%; 3) the inference indicator indicates a percentage of 46.66%; 4) the situation indicator exhibits a percentage of 61.11%; 5) the clarity indicator records a percentage of 40.83%; and 6) the overview indicator presents a percentage of 31.66%. The primary measure of students' critical thinking proficiency is their ability to focus. Meeting this criterion entails accurately presenting both the provided information and the posed questions. Analysis of the students' responses reveals that among the 30 students, only one could comprehensively and precisely articulate the given data and questions. Nine others managed to address the provided information and questions, albeit with lesser accuracy. The remaining 20 students either presented the provided information without

addressing the questions or vice versa. For further elucidation, reference can be made to Figure 1, which depicts one of the responses from a student named MPS, belonging to the aforementioned group of 20 students.

Figure 1
Student MPS's Response

From the description provided in Figure 1, it is evident that the student named MPS did not note any known information or core issues. Instead, this student immediately proceeded to the second indicator, which involves structuring the problem in matrix form. This finding prompted the researcher to conduct interviews with two deliberately chosen students, namely MPS and SSS, using purposive sampling, which is a sample selection technique based on specific considerations, as outlined by Sugiyono (2019). Subsequently, the interview transcripts reflecting the work results of student MPS are presented.

P   : Have you carefully read the problem to ensure understanding of its intended meaning?
MPS : Yes, I have read it and read it carefully as well.
P   : After reading and understanding the problem, what do you know about the information that is already known and what is asked about in the problem?
MPS : What I know is that it is related to the passenger and baggage weight matrix, Mr. What you are asking is about the total number and product of the passenger and baggage weight matrix.
P   : Next, why don't you include the information you know or what is asked about the problem on your answer sheet?
MPS : Excuse me Mr. I immediately arranged the problem in matrix form because in my view, the problem in the question was clear and understood. In addition, I want to save processing time.

After conducting interviews with six students, the results showed that the majority of them were able to solve the matrix mathematics problems both in writing and orally, as seen from their ability to state the information that was known and what was being asked. However, some subjects experienced problems, where they did not include complete information or even did not include what was known and asked about the problem at all. They stated that the main reason was time constraints, and conversely, they felt that the problems given were very clear so they thought there was no need to write detailed information on the answer sheet.

Furthermore, the second indicator of students' critical thinking abilities is "reason", where students provide reasons related to the problem formulation they created. The results

of the analysis of students' answers showed that of the 30 students in the sample, only 3 of them were able to provide correct reasons. In other words, only one in ten students was inaccurate in giving reasons, and 15 students did not give reasons correctly. For further understanding, you can see Figure 2 which depicts one of the answers from a student named DINC, who is included in the 10 students.

Figure 2
Student DINC's Response

From Figure 2, it can be seen that DINC students wrote the reasons correctly but incompletely. Below is a transcript of the results of the interview regarding the results of DINC students' work.

P   :   What are the reasons you wrote related to this problem?
DINC :   I wrote based on the question, what I was looking for was the total weight of passengers and baggage and then the multiplication result
P   :   Do you think this reason is correct?
DINC :   Yes Mr, because I am based on the question

After interviewing three students, the researcher found that the majority of students did not provide reasons related to the information previously written in the preceding steps. They argued that the given problem was already clearly stated in the question, so they believed there was no need to provide detailed reasons regarding the information in the answer sheet. Furthermore, the third indicator of students' critical thinking ability is inference, where students explore information to solve the presented problem. The analysis of students' responses showed that out of the 30 sampled students, 4 of them were able to accurately write down additional information, 13 students wrote down additional information but less accurately, and 13 students did not write down additional information. For a more detailed illustration, please refer to Figure 3, which displays one of the responses from a student named RUP, who is among the 4 students mentioned above.

Figure 3
Student RUP's Response

From Figure 3, it can be seen that RUP students wrote the reasons correctly but incompletely. Below is a transcript of the interview results regarding the results of RUP students' work.

P   :   What do you understand further regarding this question?

RUP : What I understand is related to taking the passenger weight matrix with P and the baggage weight matrix with H and then looking for the results of adding and combining these matrices.

      After conducting interviews with 3 students, researchers found that the majority of students did not write down further information related to the problem in question. They are of the opinion that the problems in the questions are clear, so in their opinion, there is no need to provide reasons regarding the detailed information in the answer sheet. Furthermore, the fourth indicator of students' critical thinking abilities is "situation", where students are able to use the information presented to solve problems. From the results of the analysis of students' answers, it can be seen that of the 30 students in the sample, 6 of them were able to use the information by writing answers completely and correctly. A total of 16 students used information by writing half or most of the correct answers, while 8 students used information by writing answers but the answers were wrong or only a small part of the answers were correct. For a clearer understanding, please see Figure 4 which displays one of the answers from a student named MC who is one of the 6 students.

Figure 4
Student MC's Response

      From Figure 4 it can be seen that MC students have been able to use the information and solve the problems presented completely. The following is a description of the results of the interview regarding the results of MC students' work.

P : How do you solve the problem with this question?

MC : The way I add up the passenger and baggage weight matrices, and multiply the passenger and baggage weight matrices too.

P : Are the steps you have implemented in accordance with what was required in the problem?

MC : I think so Mr.

P : In your opinion, are there other methods that can be used to solve this problem? If yes, please explain the steps.

MC : As far as I know, that's all, Mr.

P : Do you face challenges or difficulties in dealing with these problems?

MC : According to my own experience, to be honest, I found it a little difficult, Mr, because some of the numbers used were quite large, so it took longer to complete the process and I was not careful regarding the multiplication process, Mr.

After interviewing 3 students, the researcher found that the majority of students utilized the information by providing partially correct or mostly correct answers. They argued that the numbers in the problem were quite large and the time for completing the task was limited. Furthermore, the fifth indicator of students' critical thinking ability is "clarity," where students are able to draw conclusions. From the analysis of students' responses, it is evident that out of the 30 sampled students, 5 of them were able to draw conclusions accurately, 10 students were able to draw conclusions but less accurately, and 15 students did not draw conclusions. For a clearer understanding, please refer to Figure 5, which displays one of the responses from a student named FBP, who is among the 5 students mentioned above.

Figure 5
Student FBP's Response

From Figure 5 it can be seen that FBP students have been able to make conclusions but are not precise. The following is a description of the results of the interview regarding the work of FBP students.

P : After you solve the problem, can you draw a conclusion as a final step in solving the problem?
FBP : Thank God I can, Mr
P : What can you draw as a conclusion from solving this problem?
FBP : The conclusion is that the total weight of passengers and baggage weight in matrix form matches what I wrote in this answer sheet, Mr, then the multiplication results also match what I wrote in this answer sheet.
P : Do you find it difficult to draw conclusions? Please explain!
FBP : No Mr, I didn't experience any difficulties, because I just mentioned what I was looking for earlier, Mr
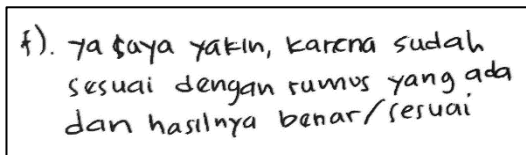P : Are you sure about the conclusions you have mentioned?
FBP : Sure.
P : If that's the case, why don't you write the conclusions you mentioned earlier on your answer sheet?
FBP : Sorry Mr, I didn't explain the final conclusion, because I think just writing the matrix is already a conclusion.

After conducting interviews with six students, the researcher found that most of the students were able to express conclusions verbally as the final solution to the problem given. However, most of them did not include this conclusion on the answer sheet, because they

believed that the final result of the problem had already been seen indirectly in the final calculation stage. On the other hand, most students face limited time in the problem solving process. Furthermore, the sixth and final indicator of students' critical thinking abilities is "overview", where students are able to thoroughly research or recheck the results of all previous steps (focus, reason, inference, situation, and clarity). The results of the analysis of students' answers showed that of the 30 students in the sample, 22 of them were able to re-check the validity of the results obtained as a whole but were not quite accurate, and 8 students did not re-check the validity of the results obtained as a whole. For further understanding, please see Figure 6 which displays one of the answers from a student named RNJ who is included in the 22 students.

Figure 6
Student RNJ's Response

From Figure 6, it can be seen that RNJ students have been able to re-check the validity of the results obtained as a whole but are not quite accurate. Below is a transcript of the interview results regarding the results of RNJ students' work.

P   :   Are you sure about the results of your answer? Give an explanation!
RNJ :   Sure Mr, because it is in accordance with the existing formula and the results are also correct or appropriate.
P   :   Are there any other events that you know of to double check your answers?
RNJ :   No Mr

After conducting interviews with students, researchers found that the majority of students were able to express their ability to thoroughly check the validity of the obtained results but lacked precision. In checking the validity of their answers, students did not employ other steps related to solving them, but merely revisited the answers based on clarity indicators. On the other hand, most students faced time constraints in problem-solving. Based on the explanation and analysis above, it can be concluded that the critical thinking ability of eleventh-grade students at Putra Bangsa Vocational High School, particularly in the context of matrix material within Tourism Travel Planning, is categorized as low, with a critical thinking indicator percentage of 43.09% (Riduwan, 2018). These findings align with those of Demircioglu et al. (2023), Lestar et al. (2023), Liu & Pásztor (2022) and Utomo et al. (2023) which state that students' critical thinking abilities are still low.

CONCLUSIONS

Based on the results and discussion section of the data analysis, it can be concluded that the critical thinking ability of eleventh-grade students at Dirgantara Putra Bangsa Vocational High School is still relatively low. The contributing factors include the percentage of students who fulfill each critical thinking indicator remaining below 50%, especially in the areas of analysis, evaluation, and analytical inference, indicating a very low level of skill. This condition arises due to suboptimal understanding of matrix concepts, students rushing to conclusions without further analysis, insufficient knowledge of geometry, difficulty in

applying congruence concepts, and a lack of familiarity with responding to mathematics problems requiring analysis and evaluation.

This study provides insight into the state of critical thinking abilities among eleventh-grade students at Dirgantara Putra Bangsa Vocational High School. It is hoped that with an understanding of this condition, teachers and researchers can design and develop learning experiences that encourage students to practice critical thinking, thus enabling them to become accustomed to this skill. Recommendations for other researchers planning similar studies include validating the tests given to students to enhance problem content and using language in tests that are more effective and easily understood. It is also suggested to conduct interviews outside the classroom to prevent students from being influenced by their peers.

For teachers, it is advised to engage students in learning by consistently encouraging them to think critically, providing tasks containing critical thinking questions, monitoring students' critical thinking abilities through specialized tests, and engaging in discussions with students to strengthen their critical thinking skills.

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