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Analysis of high school students' mathematical problem-solving ability in solving Riau Islands culture-based mathematical problem

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Abstract

Existing studies show that problem-solving is still a problematic learning outcome faced by grade XI students at SMA Negeri 1 Bintan Timur. This study aims to describe the mathematical problem-solving ability of high school students in the context of the Malay culture of the Riau Islands. The type of research applied is descriptive qualitative. The source of information for this study came from students of class XI E at SMA Negeri 1 Bintan Timur. The data collection methods applied consisted of tests, interviews, and documentation. The data analysis process in this study included data reduction, data presentation, and conclusion. The results of this study indicate that there are 2 students with a percentage of 7% in the high category, 9 students with a rate of 33% in the medium category, and 16 students with a percentage of 60% in the low category. Integrating Malay culture in mathematics research can help students understand mathematics in everyday life and enrich their understanding. In addition, students learn theory and see the real application of mathematics in their daily lives.

Keywords: mathematics problem; mathematical problem solving; malay culture of the Riau Islands

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I. Introduction

Problem-solving involves using learned mathematical concepts, principles, and skills to solve non-routine problems (Ahdianto & Marsigit, 2018). In mathematics education, problem-solving is an important skill students can instill in themselves. According to Kurniawati, Raharjo & Khumaedi, (2019), students need to develop problem-solving skills when facing increasingly complex challenges in everyday life. By practicing, students can make decisions more wisely and precisely.

Based on the PISA assessment in 2022, students' mathematical abilities in Indonesia have increased in ranking compared to 2018. Indonesia is ranked 70th out of 81 countries. However, although the ranking in PISA 2022 has increased, the scores obtained in each reading, science, and mathematics assessment subject have decreased. Indonesia experienced a decrease in scores for each reading, mathematics, and science assessment subject. The score obtained for mathematical ability in the PISA assessment 2022 was around 366 points, a

decrease of 13 points compared to the PISA assessment 2018, which was around 379 points. This indicates that students in Indonesia also experience low mathematical ability. Based on the results of PISA in 2022, the COVID-19 pandemic was the cause of the decline in learning outcomes internationally (Kemendikbudristek, 2023). Furthermore, the non-routine tasks from real-world PISA assessments are the reason for Indonesian students' poor mathematical proficiency (Utami & Puspitasari, 2022).

A previous study conducted by Mariam, Rohaeti & Sariningsih, (2019) found that class XII students of Madrasah Aliyah in Cimahi City had relatively low mathematical problem-solving abilities, with an average percentage of 56.5% based on a student score of 226 with 20 students. This is evident from the indicators of problem-solving that students have not fulfilled. Many of them find it difficult to understand the problem. In addition, they also have difficulty planning a solution strategy to answer each question. As a result, students cannot solve problems correctly or recheck their answers. A similar study was also conducted by Hermawati, Jumroh & Sari, (2021), and the average percentage of problem-solving ability of students at SMP Negeri 15 Palembang was 41.72% of 100%. The average percentage obtained can be categorized as low. The data evaluation results show that the problem-solving skills of junior high school students in Sungai Kakap are considered inadequate. This assessment is based on three specific indicators of problem-solving skills: formulating solution strategies, performing calculations, and verifying results, with an average percentage below 50%.(Agustami, Aprida & Pramita, 2021).

In line with the issue of minimal skills in solving mathematical problems, there are signs that grade XI students at SMA Negeri 1 Bintan Timur are also facing the same situation. This was revealed in an interview with one of the teachers at the school, who said that the skills of grade XI students in solving mathematical problems were still unsatisfactory. Students struggle to identify problems and plan solutions to mathematical story problems. This aligns with Buyung & Sumarli's (2021) opinion that the challenge in creating strategic solutions lies in students' lack of understanding of the problem and their lack of knowledge of solving story problems, making it difficult for them to apply the concept effectively. Based on data obtained at SMA Negeri 1 Bintan Timur regarding the education report card in the 2024 National Assessment, 80% of students are good at achieving their numeracy competency limits. However, some students still lack competency in the geometry domain, scoring 56.43.

According to Sulistiowati (2022), Students' difficulties in solving problems are due to a limited understanding of mathematical ideas related to the problems faced. One of the causes of low problem-solving abilities in students is the less suitable learning model used by teachers to explore problem-solving abilities in students (Musdalifah, Barambangi & Arifin, 2023; Muthia, Sugandi & Setiawan, 2024). According to Sinaga, Siagian & Hasibuan, (2021), students experience difficulties answering problem-solving questions because they lack understanding of concepts, have little practice solving problems, and are not interested in studying mathematics. One of the mathematical fields that is useful in everyday life is trigonometry. One of the uses of trigonometry material in astronomy is determining the distances of stars in space. Trigonometry is one of the areas in mathematics that can measure mathematical problem-solving abilities. The characteristics of trigonometry are abstract, so problem-solving is required so students can understand the theories better and relate them to everyday events (Tunnajach, 2021). However, sometimes trigonometry is complex for students because many formulas must be memorized; if there is an error in writing the definition of trigonometry, the next steps in solving it will also produce the wrong answer. This will make it difficult for students to show the steps they used

to solve the problem (Utama, Budiono & Dyah, 2022).

Mathematics can help students improve their ability to solve problems. Providing non-routine problems is an effective way to measure problem-solving skills. By providing non-routine problems, students can be trained to use various mathematical concepts in different contexts. Ultimately, this enables students to apply the knowledge they have acquired regularly to address various issues they encounter (Indriana & Maryati, 2021).

One effort that can be made so that non-routine problems can provide experience to students is to utilize culture in the context of learning (Siregar et al., 2024; Annisha, 2024). Providing non-routine problems with a cultural context is hoped to help students become closer to learning. Muslimahayati (2020) said that to make learning meaningful and more enjoyable for students, local wisdom must be introduced to preserve it.

This study utilizes the local culture found in the students' environment as a basis for application in the context of the problem. The local culture that is raised as the context of the problem is Malay culture. This is because Malay culture originates from the Riau Islands province, where the researcher conducted the research.

The local culture, taken as the context of the question, is Tanjak and Perahu Jong. Below are the findings of an ethnomathematics exploration of Tanjak and Jong boats.

Table 1. Tanjak ethnomathematics exploration results

Domain	Activity	Mathematical Concepts that Emerge	School Math Content
Designing	Measuring and cutting fabric	- Relationship between flat shapes (squares and isosceles right triangles) and their derived characteristics (sides, diagonals, hypotenuses) - Measurement of length using non-standard units - Diagonal symmetry - Area of flat shapes	Two-dimensional Figure Length Measurement Area of Flat Shapes
	Fold the fabric to create the final shape of a ladder	- Measurement of length using non-standard units - Comparison of length measurement results with standard and non-standard units - Prediction of length, comparison, and proportion	Measurement Comparison and proportion
	Making a tanjak head belt	- Length Comparison	Comparison

Table 2. Results of the Jong Boat ethnomathematics exploration

Domain	Part of a Jong Boat	Mathematical Concepts that Emerge	School Math Content
Explain	Jong Boat Body	Reflection and Angle	Geometric Transformation
	Kate	Reflection	
	Ganda Kate	Straight Line Concept	Straight Line
	Kate's House	Rectangle	Two-Dimensional Figure
	Sauk	Right Angle	Angle
	Sail	Trigonometry, Acute Angle, Right Angles, and Slope	Trigonometry

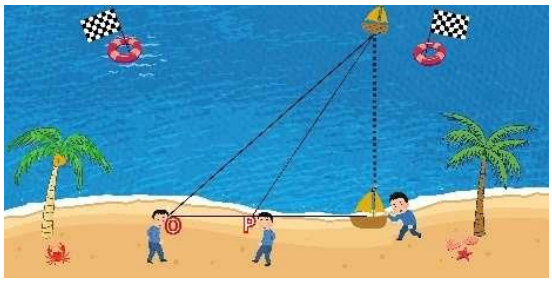
Tanjak and Perahu Jong are two examples of cultures from the many cultures in the Riau Islands. The reason for choosing Tanjak and Perahu Jong as the context of the question is to introduce students to the culture around them so that students can preserve existing cultures and learn mathematics through these cultures. Although many researchers have discussed research related to mathematical problem-solving abilities, only a few have tried to link everyday problems that make mathematical problems contextual, especially in local culture. Therefore, the researcher is interested in conducting a study entitled "Analysis of High School Students' Mathematical Problem-Solving Ability in Solving Problems in the Context of the Riau Islands Malay Culture. "Therefore, this study sought to ascertain high school students' aptitude for solving mathematical problems within the framework of the Malay culture of the Riau Islands.

II. Research Method

This study applies a qualitative descriptive approach to comprehensively understand high school students' skills in solving mathematical problems in the context of the Riau Islands Malay culture. It was conducted in the first semester of the 2024-2025 academic year at SMA Negeri 1 Bintan Timur. Tests, interviews, and documentation were the methods used to collect data. Test sheets, interview guidelines, and recording equipment were the tools utilized. The questions given were 3 descriptive questions in the context of the Riau Islands Malay culture. Before the questions were given to students, the questions had been validated by 2 validators. After the validator declared the questions valid, the next step was to provide the test questions to the research subjects. After the test was carried out, an interview would be conducted with the help of a recording device from the same data source.

Table 3. Mathematical problem-solving ability test grid

Question indicator	Mathematical Problem-Solving Ability Indicator				Question Number	Question Item
	1	2	3	4		
Presented with a problem about installing ropes on a jong boat, students can analyze and determine the value of the problem given correctly and precisely.	✓	✓	✓	✓	1	Look at the following picture.  Mr. Amat wants to install a sail rope on the Jong boat. He is at point F, with a distance of $\frac{2\sqrt{3}}{3}$ meters from point G, where point G is below the mast. The angle formed by point F with the top of the mast is 60°. Mr. Amat will install the sail rope by knocking down the mast towards him until an angle of 30° is formed. The angle is formed between the mast that has been knocked down and the ground. If, when knocking down the mast, Mr. Amat steps back to point H, then what is the distance formed between the tip of the Jong Boat mast that has been knocked down and the ground?

When presented with a problem related to the jong boat game, students can analyze and determine the distance traveled by the jong boat correctly and precisely.	✓	✓	✓	✓	2	Look at the following picture!  Mr. Aan is a participant in the Jong boat race. Mr. Aan places his boat on the shore, and the boat moves straight to the middle of the sea. When the Jong boat arrives at the finish line, Mr. Aan walks to the left towards position O and sees his boat from a 45° angle. Then, from position O, Mr. Aan walks again to the right, as far as 30 m, towards position P. From position P, the Jong boat is visible in the direction of 60°. If the race's finish line is in the middle of the sea, how far is the Jong boat from the shore to the finish line?
Presented with a problem about making a tanjak, students can solve and prove the problem given correctly and precisely.	✓	✓	✓	✓	3	Look at the following picture.  \ Wirri is a craftsman of Tanjak, which is typical of the Riau Islands. Wirri plans to make a tanjak using a square-shaped cloth base with a cloth base area of 2.25 m^2. Then, the cloth will be cut into an isosceles right triangle with one angle measuring 45° and a hypotenuse length of 75√2 cm. Do you think the cloth base used is enough to make 8 tanjaks? Explain

Research participants were chosen from each group based on the interview findings and the test of mathematical problem-solving skills. Based on the test and interview findings, students will be classified according to how similar their answers are to the stages of problem-solving as defined by Polya's theory. Following analysis, pupils will be grouped according to the problem-solving ability group criteria in the following table.

Table 4. Categories of mathematical problem-solving ability

Category Score	Category
71-100	High
41-70	Medium
0-40	Low

Source : Anggraeni & Kadarisma (2020)

The steps taken in the data for this study include data reduction, data presentation, and conclusion. At the reduction stage, the researcher examines the mathematical problem-solving

skills test results according to the assessment criteria and determines the correct answer. Also, interviews with the same data source are based on students' tests. The selection of research subjects was based on the similarity of students' responses in answering mathematical problem-solving ability test questions. Data is displayed systematically at the data presentation stage using tables, figures, and summaries. The next stage is concluding, reducing, and presenting the data. Notes taken in the field, written assessment results regarding students' abilities in solving mathematical problems, and audio recordings of interviews serve as the basis for this conclusion.

II. Results and Discussion

This study describes the mathematical problem-solving ability to solve questions in the context of the Riau Islands Malay culture. The researcher gave a test to 27 students of class XI E as prospective research subjects. The researcher gave a test sheet that included 3 descriptive questions. An analysis was conducted to assess students' skills in solving mathematical problems related to the Riau Islands Malay Culture context. Of the 27 students who completed the mathematical problem-solving ability test, the maximum score was 88, while the minimum score obtained was 0 on a scale of 100.

Table 5. Categories of mathematical problem-solving ability

Category Score	Category	Amount	Percentage
71-100	High	2	7%
41-70	Medium	9	33%
0-40	Low	16	60%

Based on the available data, it can be seen that 2 students, with a percentage of 7%, are in the high category, 9 students, with a percentage of 33%, are in the medium category, and 16 students, with a percentage of 60%, are in the low category. This shows that students' problem-solving ability level tends to be in the low category. In other words, most students have not achieved the criteria for mathematical problem-solving ability needed to complete the exam questions.

Description of the Results of Analysis of Student Answers to Question Number 1

In question number 1, students are asked to determine the distance between the demolished Jong Boat pole and the ground.

Students with the High Category

In the high category, represented by subject RR. Subject RR was chosen because subject RR represents subject F, which has a similar answer pattern.

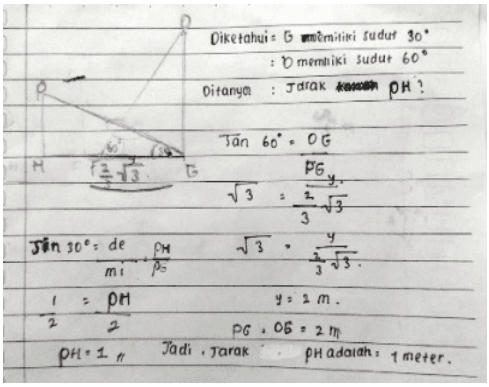


Figure 1. RR subject answer

The analysis results carried out by subject RR can meet the stage of understanding the problem, where subject RR can identify existing problems. Subject RR can plan a strategy where subject RR can represent the problem and write down the steps to solve it. Furthermore, subject RR can implement the strategy, where students can apply the planned strategy and can do the calculations correctly. At the rechecking stage, subject RR only writes the conclusion without rechecking the answer.

Students with Medium Category

In the medium category, there are three answer patterns in answering question number 1. Response pattern 1 was represented by subject RT, which represented subjects CH, DA, FF, FK, MT, and FA.

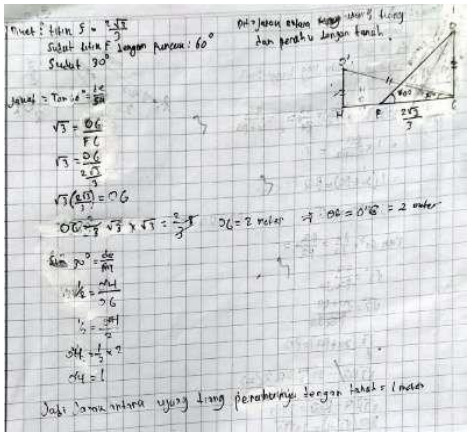


Figure 2. RT subject answer

Subject RT can identify the problem at the stage of understanding it. Subject RT can plan a strategy, representing the problem and writing down the steps to solve it. Furthermore, subject RT can implement the strategy, allowing students to apply the planned strategy and calculate correctly. Subject RT only wrote the conclusion at the rechecking stage without rechecking the answer.

Subject MR represents answer pattern 2.

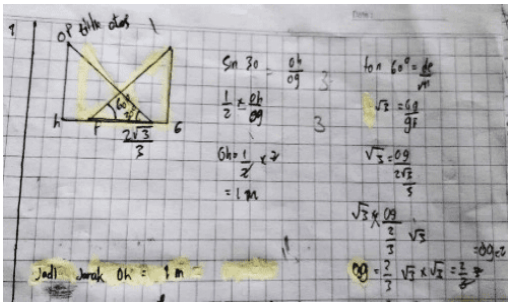


Figure 3. MR subject answer

At the stage of understanding the problem, subject MR can identify it. Subject MR can plan a strategy, write down the steps to solve it, and represent the problem, but the picture presented by subject MR is not quite right. Furthermore, subject MR can implement the strategy, where students can apply the planned strategy and calculate correctly. Subject MR only writes the conclusion without rechecking the answer at the rechecking stage.

Subject AP represents answer pattern 3.

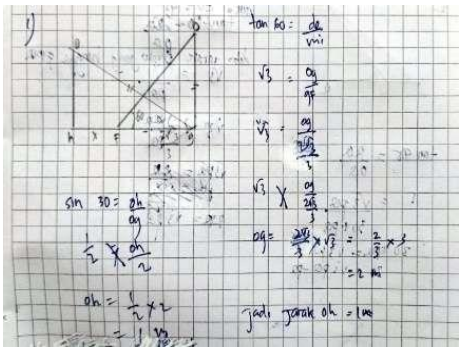


Figure 4. AP subject answer

Although AP students do not write down what they know or what is asked in the question during the problem-understanding stage, they can recognize the problem in the interview results. AP subjects can plan strategies and then implement them. At the rechecking stage, AP subjects only write conclusions without rechecking the answers.

Students with Low Category

In the low category, there are 4 answer patterns to question number 1. Answer pattern 1 is represented by subject AZ, which represents subjects BU, NF, and RZ.

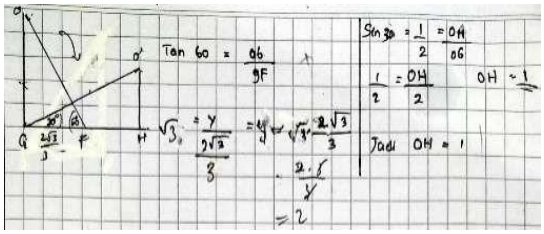


Figure 5. AZ subject answer

The data analysis found that at the stage of understanding the problem, subject AZ can identify existing problems, plan a solution strategy, carry out a solution strategy, and calculate correctly. Still, it has not met the indicator of rechecking the answer.

Answer pattern 2 is represented by subject RA, which represents subjects FB, FO, and FS.

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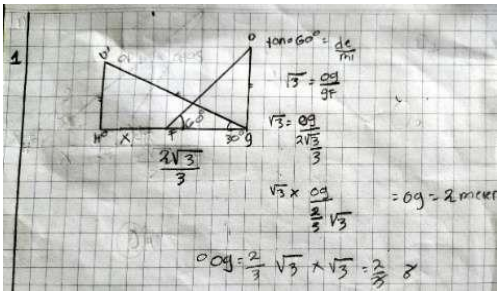

Figure 6. RA subject answer

Based on the data analysis, subject RA did not write down what was known and asked in the question at the problem-understanding stage, but in the interview results, subject RA could clarify what was known and asked in the question. At the strategy planning stage, it was seen that subject RA had not been able to meet the strategy planning indicator, and subject RA did not write the formula completely. Subject RA will likely be able to continue to the next stage, namely implementing the strategy and rechecking the answer.

Subject MA represents answer pattern 3 because subject MA has his answer.

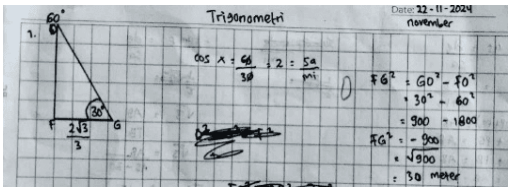

Figure 7. MA subject answer

Based on the results of the test and interview data analysis, it was found that at the stage of understanding the problem, subject MA seemed unable to identify the problem. Subject MA failed to plan a solution strategy at the strategy planning stage. This can be seen from the strategic plan used by the MA subject, which is not quite right. At the strategy implementation stage, the MA subject cannot implement the strategy according to plan. This is because the strategy planning stage was not fulfilled, so the MA subject cannot implement the strategy and recheck the answer.

Answer pattern 4 is represented by the AI subject, which represented subjects AU, FY, K, MS, TI, and UC. In question number 1, the AI subject did not provide an answer related to question number 1. Based on the interview, the AI subject did not answer because the AI subject could not understand the problem. So, the AI subject could not plan a strategy or implement a solution to recheck the answer.

According to the test results and interviews about the response patterns of students with high and medium mathematical problem-solving skills, the two student groups are capable of meeting the three requirements for answering question number 1: comprehending the problem, formulating a plan, and putting the plan into action. However, they do not yet fully support the rechecking indicator. Meanwhile, students with low mathematical problem-solving abilities tend to be unable to meet these indicators in answering question 1.

Description of the Results of Analysis of Student Answers to Question Number 2

In question number 2, students are asked to determine the distance of the Jong Boat from the start line to the finish line.

Students with the High Category

In the high category, there are 2 answer patterns in answering question number 2. Subject RR represents answer pattern 1.

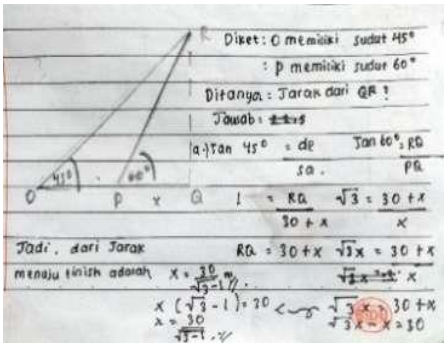

Figure 8. RR subject answer

The analysis results carried out by subject RR can meet the stage of understanding the problem, where subject RR can identify existing problems. Subject RR can plan a strategy where subject RR can represent the problem and write down the steps to solve it. Furthermore, subject RR was not able to

calculate correctly during the implementation of the strategy. At the stage of rechecking, subject RR can write a conclusion, but the conclusion given is not quite right. Answer pattern 2, represented by subject F.

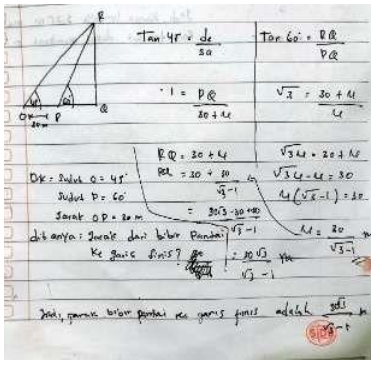

Figure 9. F subject answer

The analysis results carried out by subject F can meet the stage of understanding the problem, where subject F can identify existing problems. Subject F can plan a strategy, where Subject F can represent the problem and write down the steps to solve it. Furthermore, subject F can implement an approach where students can apply the planned strategy and calculate correctly. At the stage of rechecking, subject F only writes a conclusion without rechecking the answer.

Students with the Medium Category

In the medium category, there are four answer patterns to question number 1. Answer pattern 1 is represented by subject RT, which represents subjects DA and MT.

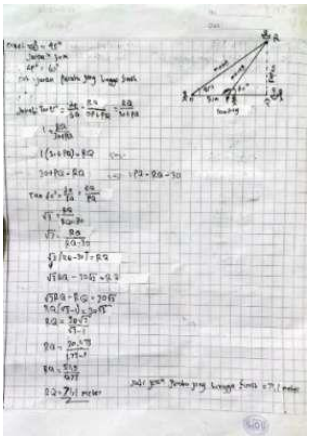

Figure 10. RT subject answer

At the stage of understanding the problem, subject RT can identify the problem. Subject RT can plan a strategy, where subject RT can represent the problem and can write down the steps to solve it. Furthermore, subject RT can implement the strategy, where students can apply the planned strategy and can do the calculations correctly. At the rechecking stage, subject RT only writes the conclusion without rechecking the answer.

Answer pattern 2 is represented by subject CH, which subject AP represents.

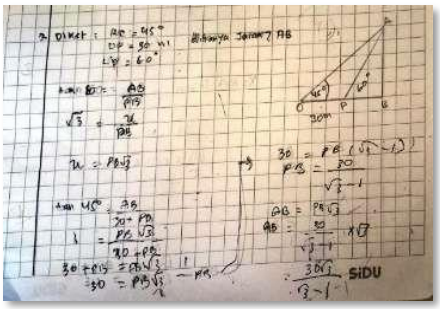

Figure 11. CH subject answer

Based on the data analysis results, subject CH can understand the problem, whereas subject CH can identify the existing problems. Subject CH can plan a strategy. Furthermore, subject CH can do the calculations correctly at the stage of implementing the strategy. However, when rechecking the answer, subject CH did not write down the conclusion or recheck the answer.

Subject MR represents answer pattern 3.

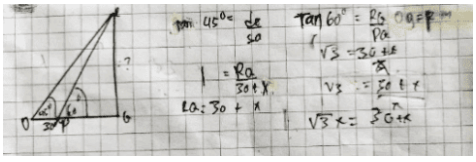

Figure 12. MR subject answer

The results of the data analysis show that even though subject MR did not write down what was known and asked, the interview results said that subject MR could understand the problem being faced. Subject MR appears to be able to plan a strategy, but at the stage of implementing the strategy, subject MR has

difficulty calculating correctly. As a result, when the indicators are at the rechecking stage, the answers.

Answer pattern 4 is represented by subject FF, which represents subjects FK and FA.

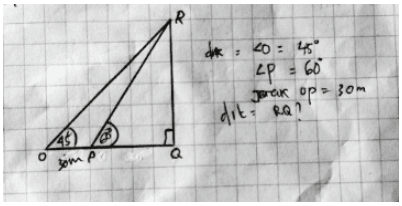

Figure 13. FF subject answer

Subject FF can understand the problem based on the results of the data analysis conducted. However, subject FF cannot meet the indicators of planning a strategy, implementing a strategy, and rechecking the answers.

Students with Low Category

Subject AZ represents answer pattern 1,

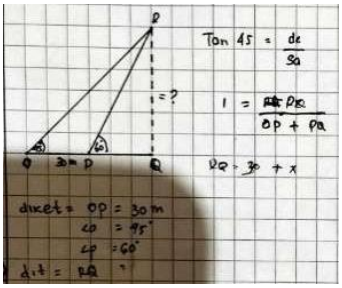

Figure 14. AZ subject answer

Where subject AZ can understand the problem, however, subject AZ has not been able to plan a solution strategy, so subject AZ cannot fulfill the problem-solving stages. Subject AI represents answer pattern 2.

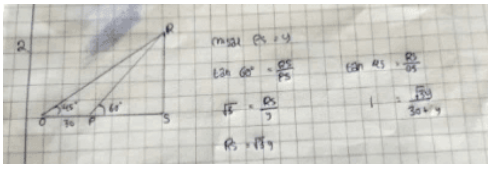

Figure 15. AI subject answer

Based on the data analysis results, subject AI did not seem to write what was known and asked, but the interview results showed that subject AI could understand the problem. Subject AI can plan a strategy but has been unable to do the calculations correctly. So, at the stage of rechecking the answer, subject AI did not write a conclusion or recheck the answer.

Answer pattern 4 is represented by the MA subject, which represented subjects BU, FB, FS, K, NF, and TI.

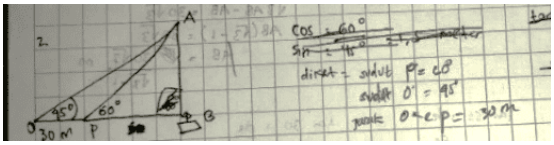

Figure 16. MA subject answer

In question 2, subject MA can write what is known and asked but cannot explain the problem. Subject MA cannot fulfill the indicators of planning a strategy, implementing a strategy, and rechecking the answer.

Answer pattern 4 is represented by the RA subject, which represented subjects AU, Fy, FO, RZ, UC, and MS. In question number 2, the RA subject did not provide an answer related to question number 1. Based on the interview, the RA subject did not answer because the RA subject could not understand the problem. So, the RA subject could not plan a strategy or implement a solution to recheck the answer.

According to data analysis, high-category students can complete the three steps of solving mathematical problems in question 2: understanding the problem, formulating a strategy, and putting the strategy into action. According to students with moderate mathematics problem-solving skills, some children can complete all three stages, which include comprehending the problem and developing a plan of action. Some kids, however, are only able to complete the problem-understanding stage. However, most pupils who struggle with mathematical problems are thought incapable of completing the phases of mathematical problem-solving.

Description of the Results of the Analysis of Student Answers to Question Number 3

In question number 3, students can prove the sufficiency of the cloth area to make eight tanjaks.

Students with High Category

In the high category, represented by subject RR. Subject RR was chosen because subject RR represents subject F, which has a similar answer pattern.

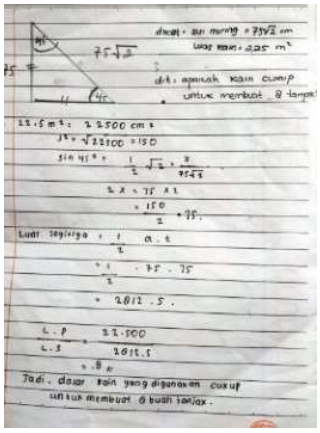

Figure 17. RR subject answer

The analysis results carried out by subject RR can meet the stage of understanding the problem, where subject RR can identify existing problems. Subject RR can plan a strategy where subject RR can represent the problem and write down the steps to solve it. Furthermore, subject RR can implement the strategy, where students can apply the planned strategy and can do the calculations correctly. Subject RR only writes a conclusion without rechecking the answer at the rechecking stage.

Students with Medium Category

There are 3 answer patterns in the medium category. Answer pattern 1 represents subject FF, which represents subject MR.

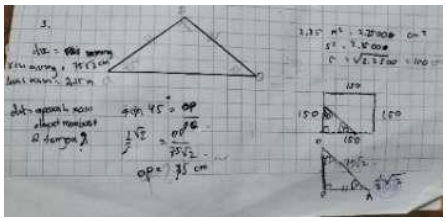

Figure 18. FF subject answer

Based on the results of the data analysis carried out, subject FF can understand the problem and can plan a strategy. However, at the stage of implementing the strategy, subject FF has not been able to complete the calculation. So, subject FF has been unable to execute the plan and recheck the answer.

In answer pattern 2, it is represented by subject RT, which represents subjects FA, FK, and MT.

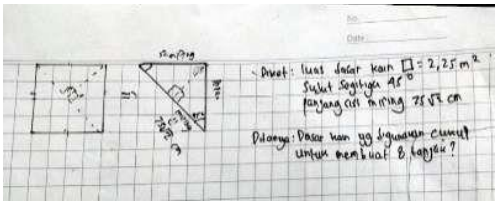

Figure 19. RT subject answer

Based on the results of the data analysis, subject RT can understand the problem, whereas subject RT can identify the existing problem. However, subject RT cannot plan a solution strategy. So, subject RT cannot implement the strategy and recheck the answer.

Answer pattern 3, represented by subject CH, representing subject AP and DA. However, in number 3, subject CH did not provide an answer related to question number 3. This shows that students in subject CH cannot complete the four steps of problem-solving, which include identifying current issues, planning strategies, implementing ideas, and rechecking the results. CH subjects feel the questions are complex and do not know the steps to solve the problem.

Students with Low Category

There are four answer patterns in the low category. Answer pattern 1 is represented by subject RA, which represents subjects TI, UC, RZ, and FO.

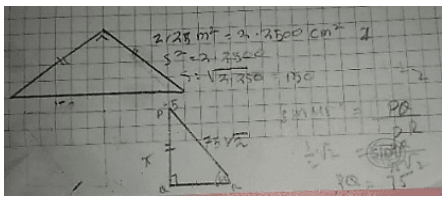

Figure 20. RA subject answer

Answer pattern 1 is represented by subject RA, which means 4 subjects. Based on the data analysis, subject RA did not write down what was known and asked in the question.

However, the interview results showed that subject RA could identify existing problems. At the strategy planning stage, students did not write down the plan that would be used to solve the problem. As a result, students could not apply the strategy and recheck the answers. In Pattern 2, it is represented by the subject AI, W, which represents subjects K and MS.

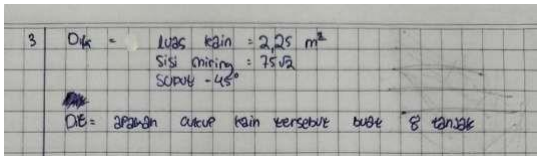

Figure 21. AI subject answer

Based on the results of the data analysis, it was seen that subject AI could only fulfill the indicator of understanding the problem but could not fulfill the indicator of planning a strategy, implementing a strategy, and rechecking the answers.

Answer pattern 3 is represented by subject AZ, which represented subjects AU, Bu, Fb, FY, FS, and NA. In question number 3, subject AZ appears unable to fulfill the four stages of problem-solving: understanding the problem, planning a strategy, implementing the strategy, and rechecking the answer. Subject MA represents answer pattern 4.

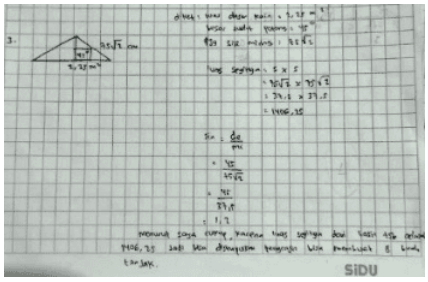

Figure 22. MA subject answer

Based on the analysis of test and interview data, it was found that at the stage of understanding the problem, subject MA appeared unable to identify it. Subject MA failed to plan a solution strategy at the planning stage. This can be seen from the strategic plan used by subject MA, which is less than ideal. At the stage of implementing the strategy, subject MA could not execute the strategy according to plan. This is because the stage of planning the strategy was not fulfilled. So, subject MA failed to implement the strategy and recheck the answer.

Discussion

Based on the data analysis results, high-category students can meet the indicators in understanding problems, planning, and implementing strategies. However, at the stage of rechecking the answers, students only write conclusions without checking the answers that have been given. This aligns with the research of Nainggolan & Napitupulu (2024), which states that students in the high category can meet all indicators of problem-solving ability well. They can understand problems well, make plans, and implement strategies that have been set. In addition, students can carry out calculations correctly and conclude. According to (Lilisantika & Roesdiana, 2023), students in the high category can solve existing problems but are not used to rechecking their answers.

According to the data analysis findings, students in the medium group can understand problems, formulate strategies, and carry out those methods in questions 1 and 2. This finding is similar to the opinion of Oktavian & Purwaningsih (2023), who stated that understanding problems, formulating strategies for solving problems, and carrying out plans are the only three measures of mathematical problem-solving skills that kids in the medium group may attain. Students, however, are unable to double-check their responses and conclusions.

In question number 3, students can meet the indicators of understanding problems. However, students tend not to be able to meet the indicators of planning strategies, implementing strategies, and rechecking answers. This is in line with Samo (2017), who showed that students with moderate skills tend to have problem-solving abilities depending on the context of the problem. In addition, students with moderate abilities have not consistently solved mathematical problems. Differences in the types of questions also affect the category of abilities students possess.

According to Gumanti, Maimunah & Roza, (2022), not all students checked or rechecked the answers obtained. Some students only concluded, and some did not make any conclusions at all. This states that students have difficulty understanding the problem. They cannot write down what is being asked in the question and have difficulty carrying out the correct mathematical procedures because they cannot check again (Pratama, 2020).

Based on data analysis, students in the low category tend not to meet the indicators for mathematical problem-solving. In general, students are less skilled in outlining problem-solving steps. However, some students can write down questions and what they know about the situation. However, they have difficulty formulating strategies and implementing solutions. As a result, students cannot complete calculations accurately, double-check their answers, and draw correct conclusions.

This is similar to the opinion of Rambe & Afri (2020), who said that students with low problem-solving skills tend not to make plans to solve problems. Even when interviewed, they also have difficulty explaining the solution plan that should be used to solve the problem. This is supported by Hikmawati, Laurens, Wattimanela, (2022), who said that students in the low category often use the four problem-solving processes inconsistently when writing. They usually forget to write down the formulas to be used and what is learned and asked. This finding is similar to the opinion of Asmiwati, Nurhayati & Masruroh, (2024). Students with low abilities need quite a long time to understand the problem, and they can still not use the four stages to solve it.

According to Adhyan & Sutirna (2022), students often forget to correct their written answers. Many students tend to immediately submit their answers without double-checking. This is in line with the opinion of Sulistiyorini & Setyaningsih (2016), who said that students face several challenges when they recheck their answers. First, many students do not know how to check their answers. In addition, they also have difficulty in managing their work time. Not infrequently, students feel that they are too lazy to recheck their answers.

Overall, it can be said that the low mathematical problem-solving ability of class XI students of SMA Negeri 1 Bintan Timur in solving questions in the context of the Riau Islands Malay culture is due to students' not being used to working on problem-solving questions, their lack of understanding of the material's concept, and their lack of skill in making problem-solving steps.

One way to reduce negative views of mathematics is through contextual learning or linking mathematics to real-world students. Mathematics and culture cannot be separated in life. The use of the Riau Islands' Malay culture in research has significant urgency, especially in strengthening cultural identity. Applying ethnomathematics allows students to learn mathematics in the context of their own culture.

Research conducted by Febrian, Astuti & Susanti, (2022) showed the results of the activity of cutting and measuring cloth produce an isosceles right triangle shape that can be used in trigonometry material at the high school level, which can make culture more relevant to school mathematics concepts. Thus, integrating Malay culture in mathematics research is not only an instrumental context but also helps students understand mathematics in everyday life and enriches their understanding of mathematics. Students learn theory and see real applications of mathematics. In the research (Syarmadi & Izzati, 2020) on the traditional game Jong Boat, there is a trigonometric mathematical concept on the screen relevant to school learning materials. In addition, in the research by Febrian (2016), ethnomathematics holds promise for the practice of school mathematics learning. It can provide a learning context that is undeniably familiar to learners in a particular area. Furthermore, it allows the rediscovery of relevant mathematical concepts that have been formally organized in the school curriculum.

III. Conclusion

The researcher can draw the following conclusions from the analysis and discussion: of the 27 students who completed the test questions on mathematical problem-solving ability, two fall into the high category with a percentage of 7%, nine fall into the medium category with a percentage of 33%, and sixteen fall into the low category with a percentage of 60%. Thus, students in the low math problem-solving skills category dominate the results. From the study results, students with high math problem-solving skills usually meet the stages of understanding the problem, preparing the strategy, and implementing the strategy. Meanwhile, students with moderate math problem-solving skills also showed the ability to meet the stages of understanding the problem, planning the strategy, and implementing the approach in questions 1 and 2. However, in question 3, students tend to meet one problem-solving stage: understanding the problem. Students with low-category math problem-solving skills usually only understand 1 indicator of math problem-solving: understanding the problem.

In the context of Malay culture in the Riau Islands, students' low mathematical problem-solving skills stem from their inexperience with problem-solving, inability to comprehend material concepts, and inability to formulate effective problem-solving procedures.

Integrating Malay culture in mathematics research is not only an instrument context but also helps students understand mathematics in everyday life and enriches their understanding. In addition, students learn theory and see the real application of mathematics in their daily lives.

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