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Analysis of Students' Mathematical Literacy Ability in Solving Minimum Competency Assessment (AKM) Problems

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Abstract: This study aims to analyze the mathematical literacy ability of SMK students in solving the minimum competency assessment (AKM) problem in the opportunity material in terms of mathematical cognitive ability. The subjects in this study were students of class XI MM 2 SMKN 1 Wonoasri with high, medium and low mathematical cognitive abilities of 1 subject each. This type of research is qualitative research. Data collection techniques based on the results of cognitive tests, AKM and interviews. Data validity techniques with engineering triangulation. Data analysis is carried out by reducing, presenting and verifying data and drawing conclusions. The conclusion of the study is that the cognitive subjects of high mathematics at level 1 write down information in detail, level 2 uses coding and solves problems by dividing them, level 3 solves problems by simplification and multiplication. The cognitive subject of mathematics is at level 1 writing down information briefly, level 2 uses coding and solves problems by simplification, level 3 solves problems by simplification and division. The cognitive subject of low mathematics at level 1 writes down the information briefly, level 2 problem solving performed has not been completed, level 3 problem solving is not in accordance with the command.

Keywords: minimum competency assessment (AKM); mathematical literacy; cognitive ability of mathematics

Analisis Kemampuan Literasi Matematika Siswa dalam Menyelesaikan Permasalahan Asesmen Kompetensi Minimum (AKM)

Abstrak: Penelitian ini bertujuan untuk menganalisis kemampuan literasi matematika siswa SMK dalam menyelesaikan permasalahan asesmen kompetensi minimum (AKM) pada materi peluang ditinjau dari kemampuan kognitif matematika. Penentuan subjek berdasarkan tingkat kemampuan kognitif siswa kelas XI MM 2 SMKN 1 Wonoasri.berdasarkan tes kemampuan kognitif matematika yang dibagikan diperoleh 3 subjek yang terdiri dari 1 subjek kemampuan kognitif matematika tinggi, 1 subjek kemampuan kognitif matematika sedang dan 1 subjek kemampuan kognitif matematika rendah. Jenis penelitian yang digunakan adalah penelitian kualitatif. Teknik pengumpulan data dalam penelitian ini berdasarkan hasil tes kemampuan kognitif, tes soal AKM dan wawancara. Teknik keabsahan data dilakukan dengan triangulasi teknik. Analisis data dilakukan dengan reduksi data, penyajian data dan verifikasi data serta penarikan kesimpulan. Kesimpulan dari penelitian ini adalah subjek kemampuan kognitif matematika tinggi pada level 1 menuliskan informasi secara rinci, level 2 menggunakan pengkodean dan menyelesaikan masalah dengan membaginya secara langsung, level 3 menyelesaikan masalah dengan penyederhanaan dan perkalian. Subjek kemampuan kognitif matematika sedang pada level 1 menuliskan informasi secara singkat, level 2 menggunakan pengkodean dan menyelesaikan masalah dengan penyederhanaan, level 3 menyelesaikan masalah dengan penyederhanaan dan pembagian. Subjek kemampuan kognitif matematika rendah ppada level 1 menuliskan informasi secara singkat, level 2 proses penyelesaian masalah yang dilakukan belum selesai, level 3 proses penyelesaian masalah tidak sesuai dengan perintah.

Kata Kunci: asesmen kompetensi minimum (AKM); literasi matematika; kemampuan kognitif matematika

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INTRODUCTION

Mathematics is one of the branches of science. Mathematics has an important role in the field of science and an essential foundation that everyone masters (Bernard & Senjayawati, 2019). Students are not only required to have the ability to count, but also the ability to reason logically and critically in solving problems. Problem solving is not only in the form of problems that exist in routine problems, but also problems that he faces in daily life (Utami et al., 2020), so that mathematics becomes an important subject to be studied at all levels of school (Setiawan et al., 2019). NCTM in (Maulyda, 2020) states that in mathematics it is necessary to have several abilities including: problem solving, reasoning and proof, mathematical communication, mathematical connections and mathematical representations. Reasoning skills are one of the necessary aspects of mathematical literacy skills.

The results of a survey conducted by the Programme for International Student Assessment (PISA) state that students' mathematical literacy skills in Indonesia are still ranked 72 out of 77 countries (OECD, 2018). The data shows that mathematical literacy skills in Indonesia are still relatively low, so they are not in line with the importance of mathematical literacy skills. Low mathematical literacy ability is because students think that mathematics is an abstract science so that it is difficult to understand (Agusdianita & Karjiyati, 2021). The Introduction to School Field (PLP) II activities carried out at SMKN 1 Wonoasri illustrated the shortcomings in the ability of class XI MM 2 students when solving problems in the form of formulating, applying, and also interpreting mathematics into various other contexts, there needs to be a solution to minimize the mistakes made by students (lusiana, 2017). In addition, class XI MM 2 students also still have difficulty in solving story problems whose context is not yet known and are still fixated on the context they are already familiar with. Judging from the answers written, there are variations in settlement models between students and other students. The variety of students' answers can be influenced by the cognitive abilities of each different student (Lusiana, 2017). The cognitive abilities of each student have an important role in learning mathematics because in solving maasalah is always connected with memorization and thinking activities. Mathematical cognitive ability is one of the internal factors that can affect student learning achievement (Apriani, Djadir & Asdar, 2017). Students'mathematical cognitive abilities are continuous with the reasoning contained in mathematical literacy skills.

Previous research by Muzaki & Masjudin (2019) analyzed mathematical literacy skills in terms of initial mathematical ability to problems in the form of routine problems in space building materials. Then, Utomo, Pujiastuti & Mutaqin (2020) also conducted an analysis of mathematical literacy skills in terms of students' cognitive styles. Wardani, Fathani & Alifiani (2021) also conducted an analysis related to mathematical problem-solving ability in solving AKM problems in terms of compound intelligence.

The purpose of this study is to analyze students' mathematical literacy abilities in solving minimum competency assessment (AKM) problems in the opportunity material in terms of mathematical cognitive ability. The results of this mathematical literacy ability analysis can be used to improve students' mathematical literacy skills in facing the national assessment (AN).

METHOD

Place and time of research

The research site is at SMKN 1 Wonoasri, Madiun for the 2021/2022 school year. The population is all students of class XI MM 2 SMKN 1 Wonoasri, which is 20 students. Subject retrieval was carried out through a mathematical cognitive ability test given to all students of class XI MM 2 online through google meet. This research uses qualitative research methods, which is a research procedure that uses data in the form of written or spoken words from the observed object.

Research Instruments

The research instruments used in this study are observation sheets to directly observe the characteristics of students' high, medium and middle mathematical cognitive abilities, students' mathematical cognitive ability tests are used to identify mathematical cognitive abilities owned by each student, AKM question tests in the form of a description test about the problem of opportunities to find out students' mathematical literacy abilities in solving problems, and interview instruments to find out more about students' mathematical literacy skills.

Data collection technique

Data collection in the form of an essay form test there are 5 questions for the description of opportunity material that include indicators of mathematical cognitive ability. This test question is to see the cognitive abilities of all students of class XI MM 2 SMKN 1 Wonoasri. The results of cognitive ability tests are used to determine the subject of the study. Based on the test results obtained 1 subject of high mathematical cognitive ability, 1 subject of medium mathematical cognitive ability and 1 subject of low mathematical cognitive ability. After obtaining the subject, the researcher gave 1 AKM question test in the form of an essay of material that included indicators of mathematical literacy ability. Then the data is taken during the implementation of the AKM question test. After doing the AKM question test, students were interviewed to get more accurate results.

Data analysis technique

The data analysis technique used in this study is Miles and Huberman's interactive model data analysis, which includes data reduction, data presentation, data verification, and drawing conclusions.

RESULTS AND DISCUSSION

The taking of the research subjects was carried out through a mathematical cognitive ability test given to class XI MM 2 students online through google meet. The percentage of the results of the analysis of the mathematical cognitive ability test is shown in figure 1.

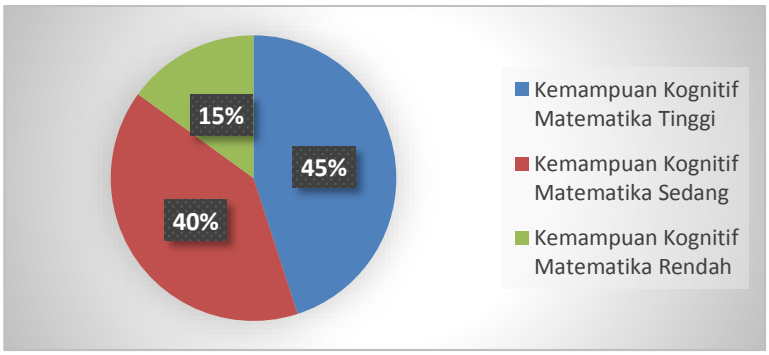


Figure 1. Percentage of Mathematical Cognitive Ability

Based on the results of the mathematical cognitive ability test, the results as shown in Figure 1, namely from 20 students who were given the cognitive ability test, 45% were classified as high, 40% were classified as moderate and 15% were classified as low. Then from each category of mathematical cognitive ability were selected 1 subject of high ability, 1 subject of medium ability and 1 subject of low ability as a sample. All three subjects were given AKM test questions for opportunity material.

There are 6 levels of indicators of students' mathematical literacy ability according to PISA in (Purwasih et al., 2018) presented in the following table:

Table 1. Mathematical Literacy Ability Indicators Based on PISA

No	Level	Indicator
1	Level 1	Answering questions with known context and all relevant information from clear questions. Collect information and carry out the means of settlement in accordance with clear orders.
2	Level 2	Interpret, recognize situations, and use formulas in solving problems.
3	Level 3	Execute the procedure well and select and implement a simple problem-solving strategy. Interpreting and representing the situation.
4	Level 4	Work effectively with models in concrete but complex situations and represent different information and relate it to real situations.
5	Level 5	Work with models for complex situations and select and implement strategies in solving complex problems.
6	Level 6	Make generalizations and use mathematical reasoning in solving problems and communicating them

The level of mathematical literacy ability used in this study is level 1-3.

1. Subjects of high mathematical cognitive ability
    a. Level 1

        At this stage, subject 1 identifies level 1 mathematical literacy skills by determining information from the AKM questions he has done. The test results at this stage can be seen in figure 2 below:

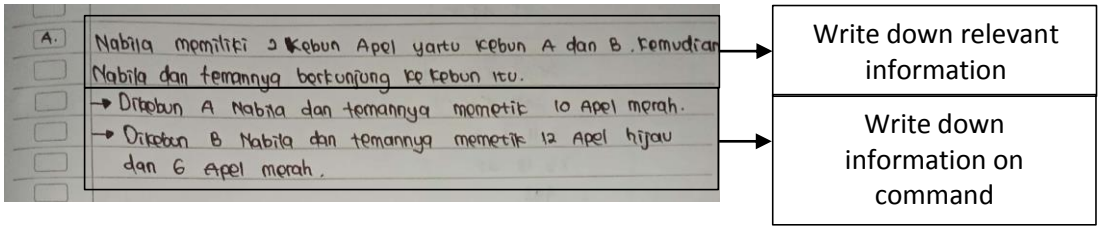


Figure 2. Test Results of Subject 1 KLM 1

b. Level 2

At this stage, subject 1 identifies the ability of mathematical literacy level 2 to recognize the situation by writing down known, asked, writing down the formula used to solve the AKM problem, solving according to the chosen formula and writing the final conclusion based on the results obtained from solving the AKM problem. The test results at this stage can be seen in figure 3 below:

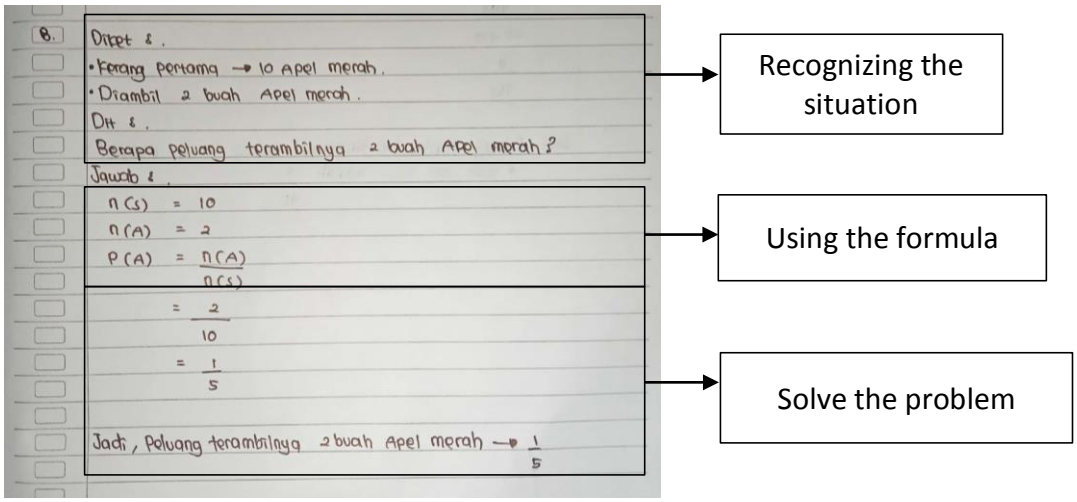


Figure 3. Subject Test Results 1 KLM 2

c. Level 3

At this stage, subject 1 identifies level 3 mathematical literacy skills by formulating strategies that will be used in solving AKM questions by writing known, asked and then taking steps to solve it starting from writing the formula, making substitutions from known into the formula used and then doing simplification and multiplication of the numbers used and write the final conclusion from the results obtained. The test results at this stage can be seen in Figure 4 below:

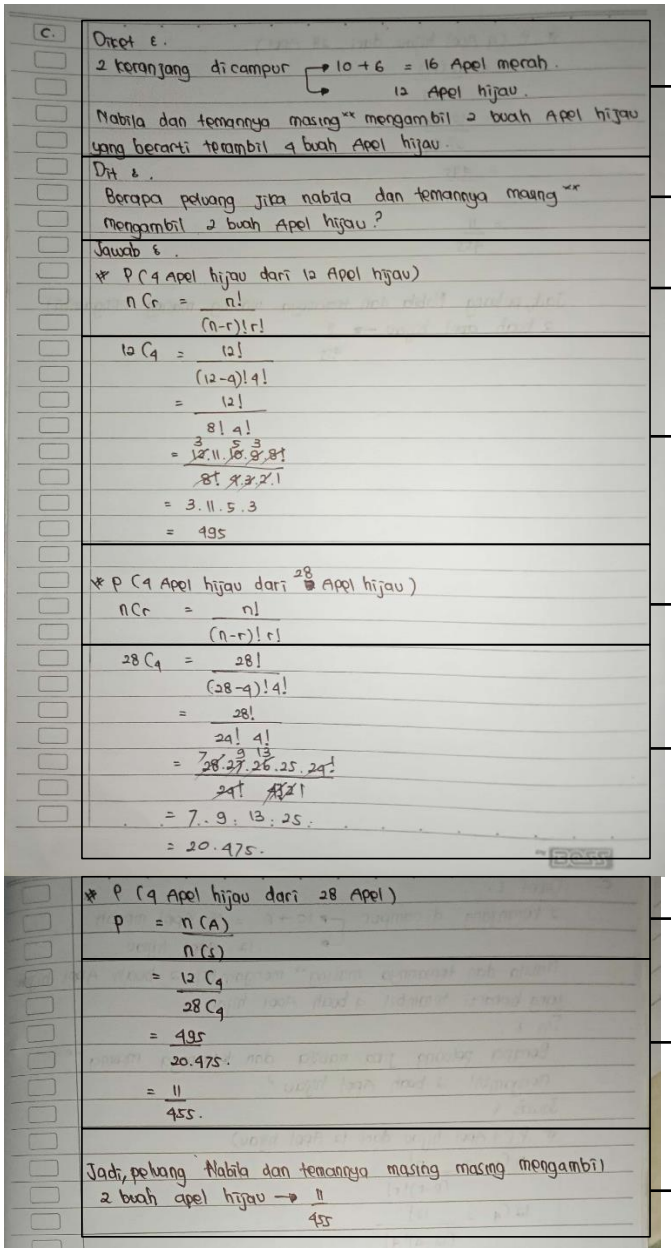


Figure 4. Results of the Test of Subject 1 KLM 3

2. Subjects of moderate mathematical cognitive ability
   a. Level 1

      At this stage, subject 2 identifies level 1 mathematical literacy skills by determining information from the AKM questions that they have done. The test results at this stage can be seen in Figure 5 below:

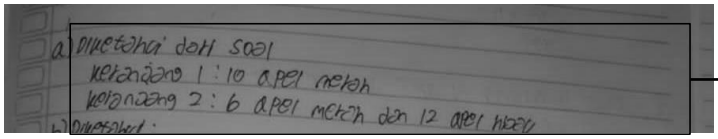


Figure 5. Results of Subject Test 1 KLM 1

b. Level 2

At this stage, subject 2 identifies level 2 mathematical literacy skills, recognizes the situation by writing what is known, being asked and writing down the formula used to solve the AKM problem. The test results at this stage can be seen in Figure 6 below:

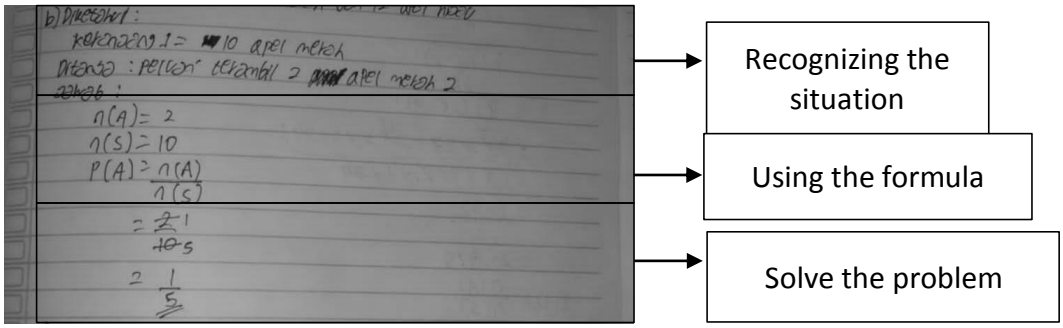
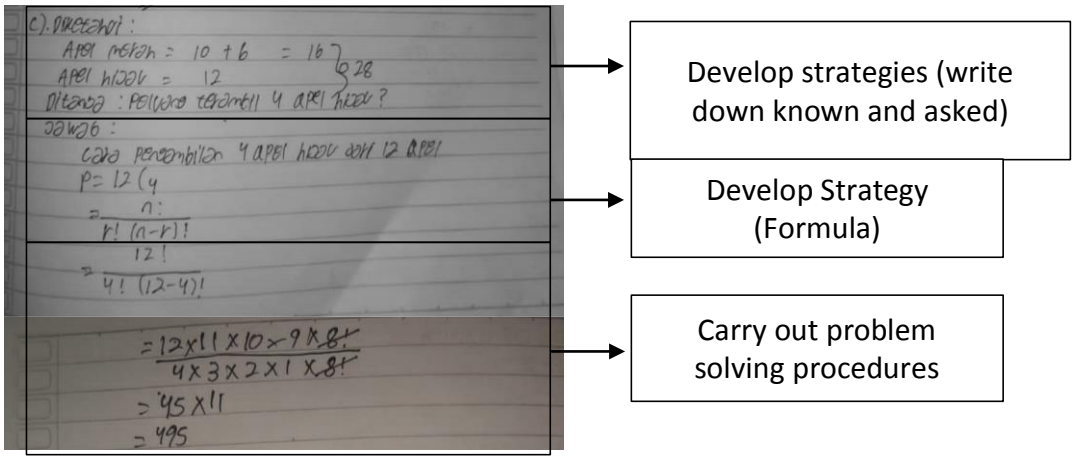


Figure 6. Test Results of Subject 2 KLM 2

c. Level 3

At this stage, subject 2 identifies level 3 mathematical literacy skills by developing strategies that will be used in solving AKM questions by writing down known, asked and performing problem solving steps starting from substitution of what is known into the formula used and continuing the problem solving process correctly. The test results at this stage can be seen in Figure 7 below:



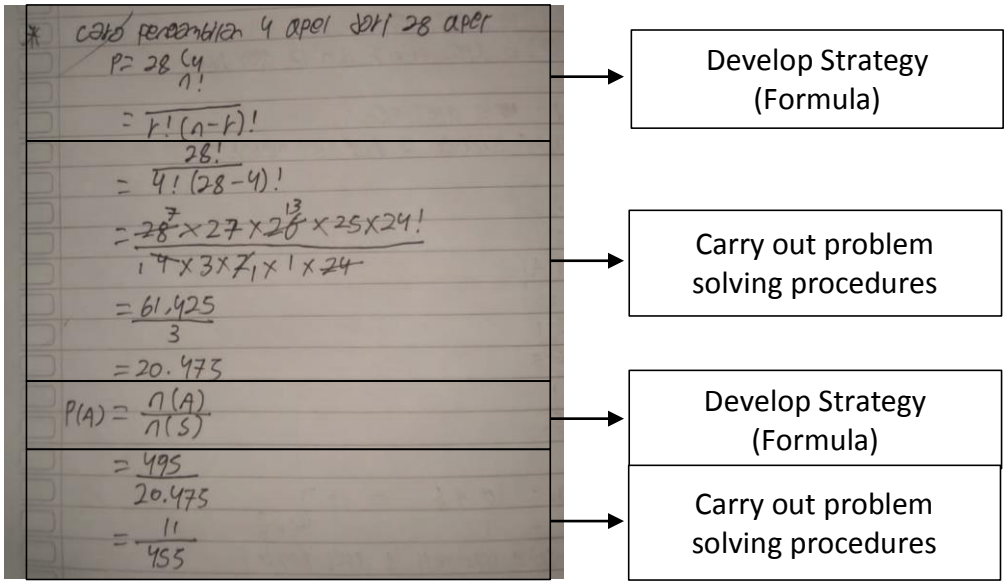


Figure 7. Test Results of Subject 2 KLM 3

3. Subjek kemampuan kognitif matematika rendah
   a. Level 1

      At this stage, subject 3 identifies level 1 mathematical literacy skills by determining the information obtained from the AKM questions that he has worked on. The test results at this stage can be seen in Figure 8 below:

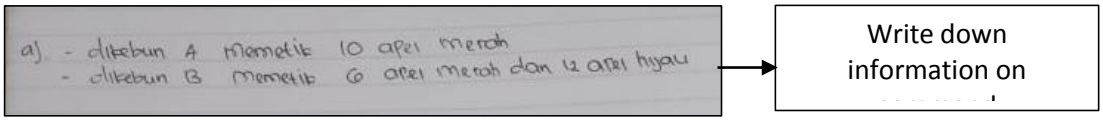


Figure 8. Results of the 3 KLM 1 Subject Tests

   b. Level 2

      At this stage, subject 3 identifies level 2 mathematical literacy skills, recognizes the situation by writing what is known, being asked and writing down the formula used to solve the AKM problem but in solving the problem only until substitution. The test results at this stage can be seen in Figure 9 below:

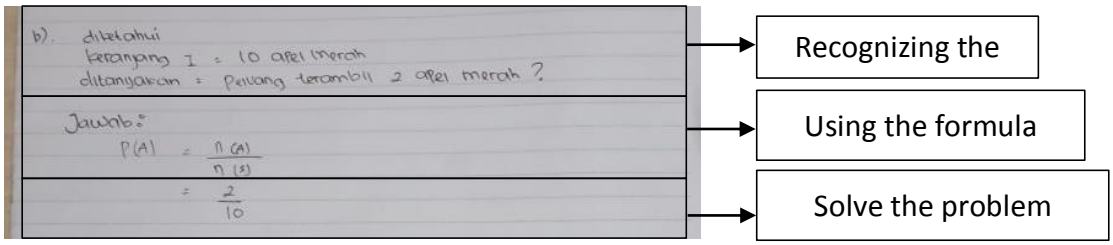


Figure 9. Results of the 3 KLM 2 Subject Tests

   c. Level 3

      At this stage, subject 3 identifies level 3 mathematical literacy skills by formulating a strategy that will be used in solving AKM questions by carrying out the completion process starting from the substitution of what is known into the formula used, but starting at the stage of formulating the strategy, the question (D2) is not quite right. The test results at this stage can be seen in Figure 10 below:

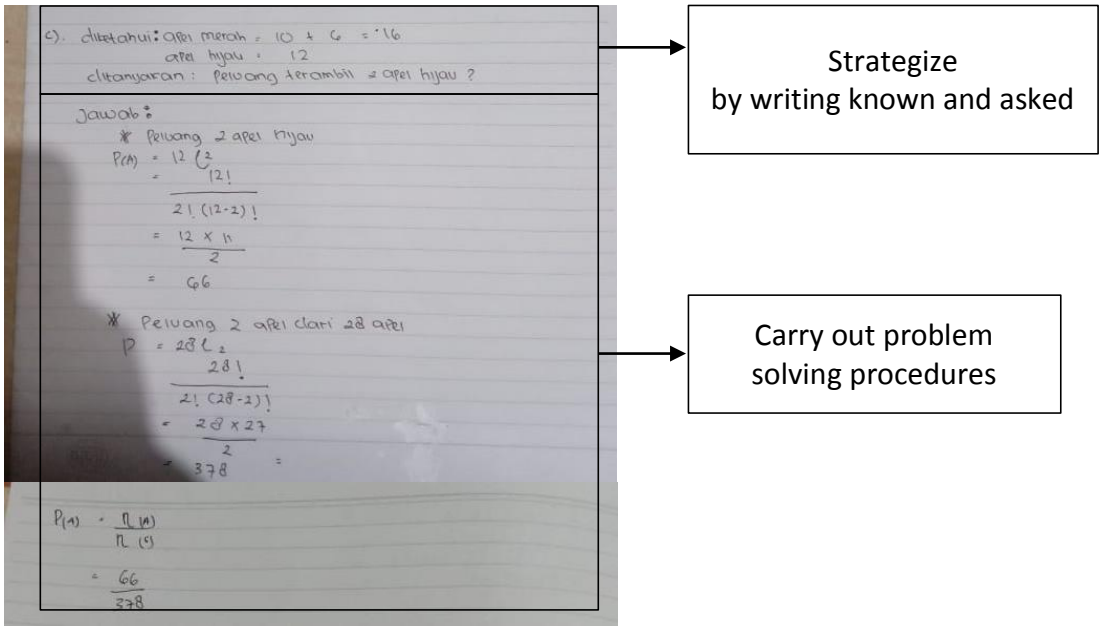


Figure 10. Results of the 3 KLM 3 Subject Tests

Based on the results of the answers from the three subjects, namely high, medium and low mathematical cognitive abilities, there are differences which are presented in the table as follows:

Table 2. Differences in Students' Mathematical Literacy Ability Based on Cognitive Ability

High Mathematical Cognitive Ability	Moderate Mathematical Cognitive Ability	Low Mathematical Cognitive Ability
Level 1		
• Write down all the information contained in the questions in detail and well structured in the form of points.	• Write down the information contained in the questions briefly in the form of bullet points.	• Write down the information contained in the questions briefly.
Level 2		
• Using coding. • Write down the general formula first, then do the solution. • Doing the solution by dividing it directly. • Write the conclusion of the final result of the calculation obtained.	• Using coding. • Write down the general formula after determining the number to use. • Doing the solution by simplifying.	• Do not use coding. • In the answer section directly write down the formula. • Perform substitution only and do not perform other operations.
Level 3		
• Write down asked according to the command.	• Write down the question correctly. • Solve problems by simplifying numbers	• Writing asked but not according to the command.

High Mathematical Cognitive Ability	Moderate Mathematical Cognitive Ability	Low Mathematical Cognitive Ability
• Doing problem solving with simplification and continued with multiplication to get the final result. • Write the final conclusion from the results obtained.	followed by division to get the final result.	• Write down the steps to solve the problem but it is not correct.

Level 1 indicators on mathematical literacy skills with high mathematical cognitive abilities appear when students are able to find information contained in the AKM questions in a detailed and structured manner. This is in line with research by Muzaki & Masjudin (2019) where students with high mathematical cognitive abilities solve AKM problems by writing down all the information they get. Level 2 indicators on the mathematical literacy ability of students with high mathematical cognitive abilities are achieved when they are able to recognize situations by writing known, asked questions and determining a good solution strategy. This is in line with Jeklin's research (2016) where students with high mathematical cognitive abilities in solving problems need to describe information in the form of being known and asked. Level 3 indicators of mathematical literacy skills with high mathematical cognitive abilities are marked by students being able to develop strategies that will be used in solving AKM problems. This is in line with the research of Muzaki & Masjudin (2019) where in solving problems of high mathematical cognitive abilities students make the strategies used.

Level 1 indicators on mathematical literacy skills with mathematical cognitive abilities are emerging when students are able to find information contained in AKM questions and can write detailed and structured information In line with research by Susanti & Krisdiana (2021) where in literacy activities students are able to find information in problems . Level 2 indicators on the mathematical literacy ability of students with mathematical cognitive abilities are being achieved when they are able to determine the final result correctly through the known writing process, asked based on the information that has been written on the known. This is in line with the research of Purwati et al. (2021) where students with moderate mathematical cognitive abilities are able to solve problems appropriately. The indicator of level 3 mathematical literacy ability with moderate mathematical cognitive ability is characterized by students being able to develop strategies that will be used in solving AKM problems starting from writing known, asked and solving them. This is in line with research (Lusiana et al., 2018) where solving problems needs to be carried out according to the plans that have been prepared.

Level 1 indicators on mathematical literacy skills with low mathematical cognitive abilities appear when students are able to find information contained in AKM questions and can write detailed and structured information. This is in line with the research of Muzaki & Masjudin (2019) where students with low mathematical cognitive abilities in solving AKM

problems students write down the information they get. Level 2 indicators on the mathematical literacy ability of students with low mathematical cognitive abilities are achieved when they are able to determine the final result based on the information that has been written on the known and determine the completion process based on being asked. This is in line with Jeklin's research (2016) where in solving problems it is necessary to describe information in the form of being known, asked. However, at level 2 the problem solving process carried out by students with low mathematical cognitive abilities is not appropriate. This is in line with Muzaki & Masjudin (2019) which states that students with low mathematical cognitive abilities are not able to solve problems at level 2 correctly. Level 3 indicators of mathematical literacy skills with low mathematical cognitive abilities are marked by students formulating strategies that will be used in solving AKM problems that are not in accordance with orders. This is in line with research by Muzaki & Masjudin (2019) where when solving problems, students with low mathematical cognitive abilities have not developed a strategy for solving them properly. Students with low mathematical cognitive abilities are not able to apply the strategies that have been planned. This is in line with Zakiah & Khairi's research (2019) where in solving problems according to the planned strategy, not all levels of cognitive ability can perform.

CONCLUSION

Based on the discussion, it can be concluded that students with high mathematical cognitive abilities are able to meet 3 levels of mathematical literacy skills, namely level 1 answering questions by collecting detailed written information in the form of bullets, level 2 solving problems using coding and solving by simplifying and write the conclusions from the solutions carried out, level 3 performs problem solving procedures by simplifying and multiplying then writing the conclusions from the completion process that has been carried out. It was concluded that students with high mathematical cognitive abilities could fulfill 3 levels of mathematical literacy skills

Students with moderate mathematical cognitive abilities are able to fulfill 3 levels of mathematical literacy skills, namely level 1 answering questions by collecting information briefly in the form of points, level 2 recognizing situations and using formulas in solving problems by using coding and solving problems by simplifying, level 3 Perform problem solving procedures by simplifying and dividing to get the final result. It was concluded that students with moderate mathematical cognitive abilities could fulfill 3 levels of mathematical literacy ability.

Students with low mathematical cognitive abilities are able to fulfill 1 level of mathematical literacy ability, namely level 1 answering questions by collecting information they write briefly, level 2 recognizing situations and using formulas to solve problems, but the problem solving process has not been carried out properly because students only make substitutions without performing other operations, level 3 performs problem solving procedures, but the problem solving that is compiled is not in accordance with the instructions

contained in the problem. It was concluded that students with high mathematical cognitive abilities could fulfill 1 level of mathematical literacy ability.

Hopefully, this research can provide additional information related to students' mathematical literacy skills in solving problems in the form of AKM, and can be used as a source for further research. The result of this study can be used as a reference for improving students' mathematical literacy skills by conducting routine reviews so that the results of this study can still be said to be valid.

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