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The Capacity Of Islamic Senior High School Students to Comprehend Mathematical Ideas and Solve Matrix Problems

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Ability to Understand Concepts, Matrix.

ABSTRACT

Kemampuan pemahaman konsep dalam mata pelajaran matematika sangat diperlukan oleh setiap siswa. Tujuan penelitian ini untuk mendeskripsikan kemampuan pemahaman konsep matematis siswa MA dalam menyelesaikan soal matriks. Penelitian dilaksanakan pada 53 siswa kelas XI di MA Mambaul Ulum Banjarejo. Teknik pengumpulan data yang digunakan adalah tes dan wawancara. Hasil penelitian yakni Kemampuan pemahaman konsep matematis siswa dalam setiap indikator berbeda-beda. Persentase indikator kemampuan pemahaman konsep siswa pada indikator ke-1 yakni 72%, indikator ke-2 yakni 93%, indikator ke-3 yakni 83%, indikator ke-4 yakni 88%, indikator ke-5 yakni 60%, indikator ke-6 yakni 55% dan indikator ke-7 yakni 60%. Persentase indikator kemampuan pemahaman konsep matematis siswa yang paling tinggi adalah merepresentasikan suatu konsep dalam berbagai bentuk matematis. Sedangkan, persentase indikator kemampuan pemahaman konsep siswa yang paling rendah yakni menerapkan prosedur atau operasi matematika dalam menyelesaikan soal. Guru dalam proses pembelajaran disarankan untuk tidak hanya menekankan pada hafalan, akan tetapi pada pemahaman konsep siswa.

The ability to understand concepts in mathematics is needed by every student. The purpose of this study was to describe the ability to understand mathematical concepts of MA students in solving matrix problems. The research was conducted on 53 students of class XI at MA Mambaul Ulum Banjarejo. Data collection techniques used were tests and interviews. The results of the research are the ability to understand students' mathematical concepts in each indicator is different. Percentage of students' concept understanding ability indicators on the 1st indicator is 72%, the 2nd indicator is 93%, the 3rd indicator is 83%, the 4th indicator is 88%, the 5th indicator is 60%, the 3rd indicator 6 is 55% and the 7th indicator is 60%. The highest percentage of students' ability to understand mathematical concepts is representing a concept in various mathematical forms. Meanwhile, the lowest percentage of students' concept comprehension indicators is applying mathematical procedures or operations in solving problems. Teachers in the learning process are advised not

only to emphasize memorization, but also to understand students' concepts.

INTRODUCTION

Math is beneficial in everyday life. One of the common sciences that are required to be studied because it provides the basic foundation of all other sciences of mathematics (Yazidah, Sulistyorini, & Kartika, 2022; Zulfayanto, Lestari, Ilmiah, & Mustangin, 2021). Human activities are linked to mathematics, just as there are products - buying and calculating and calculating objects, and so forth. This is because mathematics is a branch of science that is so closely related to human needs and real life (Handayani, 2022; Handayani, Hakim, & Putri, 2022). Besides practicing concepts in solving daily problems, students must also be able to resolve mathematical problems in daily life (Chisara, Hakim, & Kartika, 2018).

To the improvements in mathematical education has an important role. Students and teachers also become a leading role (Zulfayanto et al., 2021). Yet, more than a few students feel that mathematics is difficult because abstract, so that it is often ignored (Anggraini, 2021; Khoirunnisa, Saputra, & Yenni, 2021; Puka, Weking, & Betan, 2021). It is this notion that makes mathematics disinterested and seem boring. This results in the goal of mathematical learning not being achievable in every process (Chisara et al., 2018). To achieve the purpose of learning then the learning process must be done optimally (Handayani, 2021). One of the purposes of mathematical learning is that students are capable of mastering various abilities.

There are some abilities of students who are required to continue to be honed and enhanced in mathematics. One must stress on student concept understanding (Hernawati & Pradipta, 2021; Siki, Djong, & Jagom, 2021). The ability to understand concepts in mathematics is not only memorized by various formulas, but students are completely understanding the

given material concept (Anih, 2020). Each student must be able to grasp the concept because it is closely related to the student's problem-solving ability (Derfia, Gusmania, & Hanggara, 2020). Because it is easier to solve a student's problem if you understand the concept.

The ability to understand concepts in mathematical subjects is essential for every student. So in the learning process, it should emphasize understanding mathematical concepts (Hernawati & Pradipta, 2021). Concept comprehension becomes a cornerstone of mathematical subjects (Diana, Marethi, & Pamungkas, 2020; Hoiriyah, 2019). As is told by Diana et al., (2020) where understanding concepts in mathematics forms the basis for principles and theories. Students are obliged to discover for themselves the concepts being studied, so not only remember concepts and resolve problems based on memorized formulas (Khairani, Maimunnah, & Roza, 2021). With students massing many concepts will make it easier for students (Fajar, Kodirun, Suhar, & Arapu, 2018).

In the process of mathematical learning is required to be able to connect ideas and concepts, thus becoming a meaningful understanding. Students are expected to enhance the meanings and concepts that have been written so that they are not merely memorized (Fajar et al., 2018). One material that has a link to other ideas and concepts is the matrix. This is because the matrix must understand the operation of the matrix and several other concepts (Amalia, Ainin, Quamila, & Pramuditya, 2020). Matrix materials were present in the 11th grade at the same high school.

According to early observations and interviews that have been made in the MA Mambaul Ulum of Banjarejo acquired information that the result of studying the mathematics of low students is the result. Through interviews, students explain that poor comprehension of the kinds of matrices and the operation of matrices, so the written answer result is often wrong. Furthermore, students also explained that less understanding of some of the mathematics concepts already recorded involves how to operate a matrix, thus difficulty in applying it to solve the problem.

Based on the background researchers aim to know and describe the ability to understand the mathematical concept of student ma in solving the matrix problem.

METHODS

This type of research uses descriptive qualitative. The research was conducted on 53 students in the MA Mambaul Ulum of

Banjarejo. Data collection techniques were conducted using tests and interviews. The writing test contained 7 given problems on the matrix according to the indicator of the ability to understand concepts. Each issue represents each indicator of concept comprehension. The written test is used to know the results of the student's answers in solving the matrix problem. Later, interviews are used to dig up some information that is not yet visible from the students' answers. The data analysis techniques used are data collecting, data merging, data presentation, and a drawing of conclusions or verification.

An indicator of mathematical concepts used in the study is the adaptation of Amalia et al., 2020; Kristanti et al., (2019) among those that represent (1) redefining concepts, (2) categorizing objects by their properties, (3) representing a concept in various mathematical forms, (5) developing the necessary conditions or sufficient requirements of a concept, (6) implementing a mathematical procedure or operation in resolving a problem, (7) applying a concept in resolving a problem.

RESULT AND DISCUSSION

Research that has been carried out during the data collection process follows. The percentage of the ability to understand the student's mathematical concepts on each indicator is presented in Table1.

Table 1.
The Result Of Categorizing The Ability To Understand A Student's Mathematical Concepts

Indicators	Percentage (%)	Category
1	72%	Medium
2	93%	High
3	83%	High
4	88%	High
5	60%	Low
6	55%	Low
7	60%	Low

Based on Table 1 obtained results that the percentage of the ability to understand students' mathematical concepts at each indicator is different. In the total percentage of indicators of the ability to understand the student's mathematical concepts, the highest is the fourth indicator of 93%, representing a concept in various mathematical forms. On the other hand, the percentage of

indicators for understanding students' lowest concepts is found in the 6th at 55%, where mathematical procedures or operations are implemented in solving problems.

Following data exposure based on students' work in completing the student's ability to understand concepts on each indicator.

1. Indicators of re-explaining regarding the concept

Based on chart 1 percentage of the indicator of understanding of the first concept is 72% meaning students' ability to reexplain a concept falls into a moderate category. In conjunction with the study of Amalia et al., (2020) which states that students' ability to restate from a moderate conceptual rating. Most students have been able to re-explain a concept of a matrix described by the teacher correctly and use their language. Here is the excerpt of the correct student's answer to problem number 1.

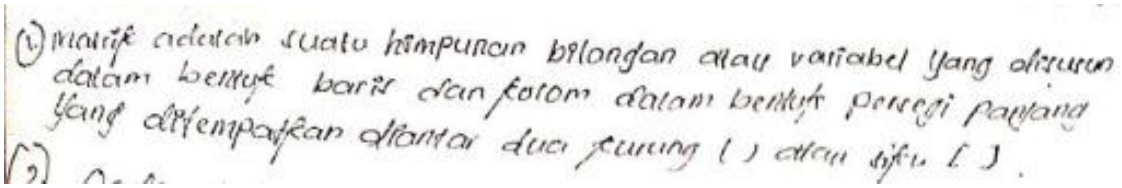


Figure 1. The student's answer to problem number 1

Based on the figure 1 student can reexplain the concept of a matrix that has been studied correctly and completed. Students may write in full from the definition of a matrix along with the notation of the writing. However, there is still an incomplete student's answer in redefining the concept of the matrix as shown in figure 2.

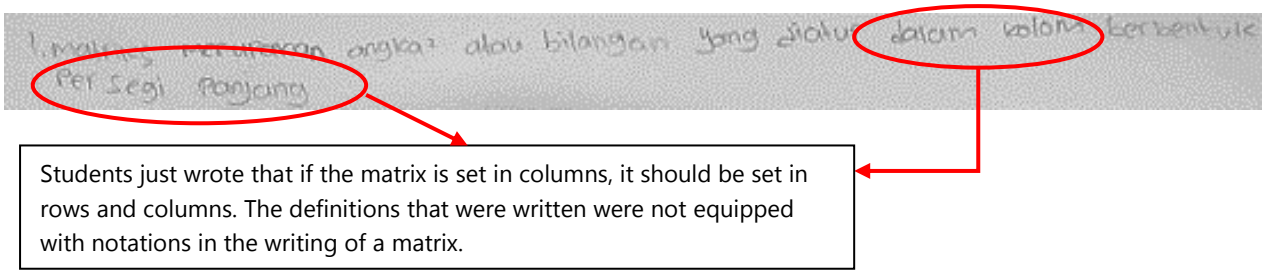


Figure 2. The student's answer to problem number 1

Based on the student's answers in Figure 2, it appears that the student has not been able to explain the matrix completed, since it simply states that the matrix is set in the column. Students did not write that the matrix was compiled in lines and

columns. Furthermore, the student did not complete the definition with the notation used in the writing of a matrix. Kusumaningrum & Pujiastuti (2021) in his study also explains that students who have not been able to explains a concept have not been able to understand the material that has been given. One cause of a student's lack of understanding of concepts is that students are less able to explain the concepts they have obtained and implement (Manul, Susilo, & Fayeldi, 2019).

2. Indicators present an example or not an example of a concept

Based on table 1 percentage of the indicator of understanding of the second concept, 93% means the students' ability to present examples/non-examples of a concept falls at high levels. Almost all students have been able to present examples/non-examples of a matrix concept described by the teacher. As Khairani et al., (2021) research also states that the ability of the student to write examples and not the examples falls very well. Here is the excerpt of the correct student's answer to problem number 2.

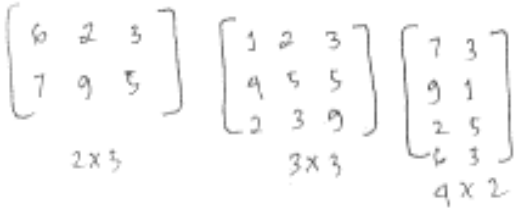


Figure 3. The student's answer to problem number 2

Based on Figure 3 it is evident that students can present examples/non-examples of a properly learned matrix concept. Students may be able to write a matrix that has the order differentially. As well as in his research Rahayu & Pujiastuti (2018) also state that one of the highest percentages in students' concept ability to demonstrate examples rather than examples. However, there are still some student's incorrect answers in writing the example matrix as in Figure 4.

Based on Figure 4 it seems that the student's answer is incorrect, it is because it is anchored between a line and a column in a matrix. Students wrote the order's three-by-two matrix and the order's 2-by-4 matrix. When students should be asked to write examples of the order's 2-x 3 matrix and the order's 4 x 2 matrix. In addition, there were the answers of the student who did not use the correct parentheses and used the element of letters.

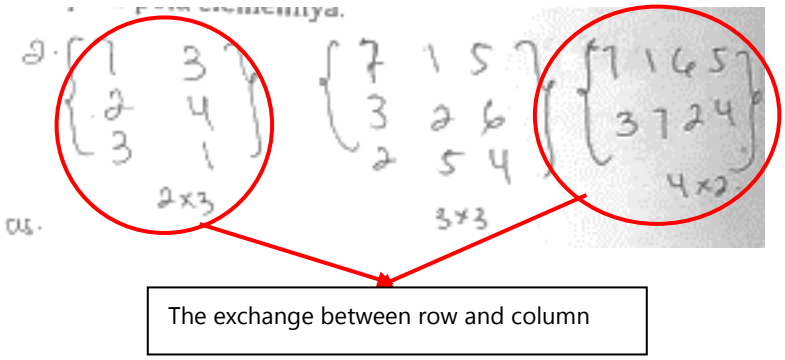


Figure 4. The student's answer to problem number 2

Based on the interview conducted, this is because students have forgotten which lines are and which columns, so when asked to write an example on the order 2 clause 3 matrix the order was transposed into the order's 3-x 2 matrix. According to Manul, Susilo, & Fayeldi (2019) in his study suggests that the majority of students have not been able to reexplain and contrast examples and not examples of mathematical materials in their language.

3. Indicators categorize objects by their properties.

Based on Chart 1 percentage of the indicator of a third concept of understanding 83% means that students' ability to categorize objects by their properties falls at high levels. In this case, most students have been able to categorize objects based on the nature of the matrix described by the teacher. In conjunction with the research of Manul, Susilo, & Fayeldi (2019) which states that the student's error in classifying objects by their very nature is only slight. Here is the excerpt of the correct student's answer to problem number 3.

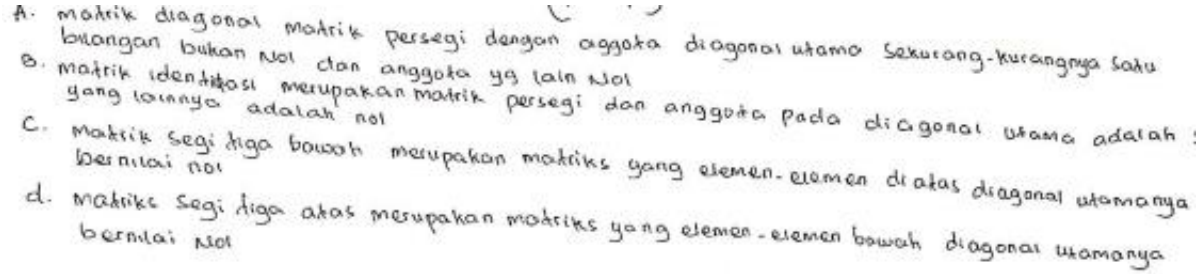


Figure 5. The student's answer to problem number 3

Based on figure 5 it appears that students have been able to categorize objects by the nature of the matrix correctly. Students can categorize known

matrices by each type correctly, the grid of a diagonal matrix, the identity matrix, the under triangle, and the upper triangle. However, there are still some incorrect students' answers in categorizing the matrix as in Figure 6.

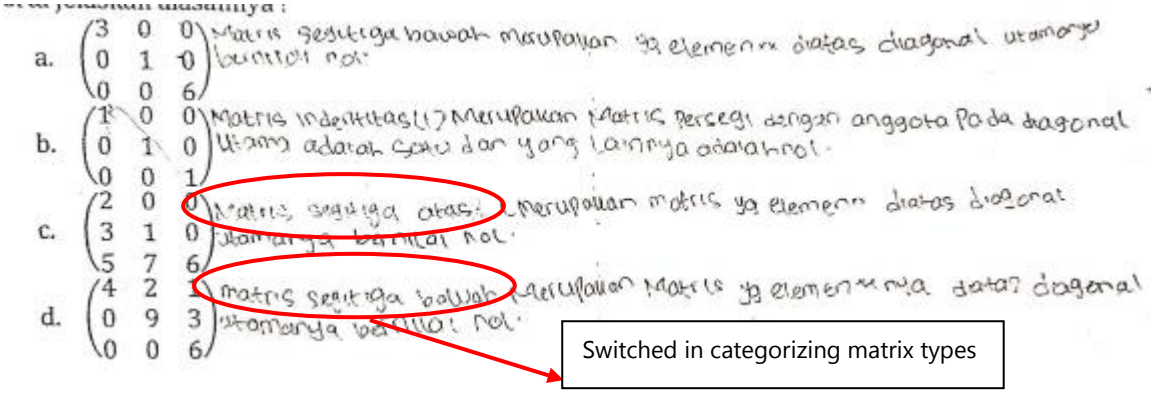


Figure 6. The student's answer to problem number 3

Based on Figure 6 it appears that the student was confused in categorizing this type of matrix. Students categorized an example of the matrix at point c in the top triangular matrix, when the matrix at point c included the lower triangular matrix.

Through student interviews explain that forgetting the definitions of the lower triangle and the top triangular matrix, thus is inappropriate in categorizing them.

4. Indicators present concepts in various mathematical forms

Based on the chart 1 percentage of the indicator of understanding of the fourth concept 88% means that students' ability to represent concepts in various mathematical forms falls at high levels. Most students have been able to represent concept matrix in the various mathematical forms the teacher has described. This goes hand in hand with the study of Kusumaningrum & Pujiastuti (2021) which states that the number of students meeting indicators representing a concept in various mathematical forms is greater. However, most students represent a matrix in the form of an equation. Here is the excerpt of the correct student's answer to problem number 4.

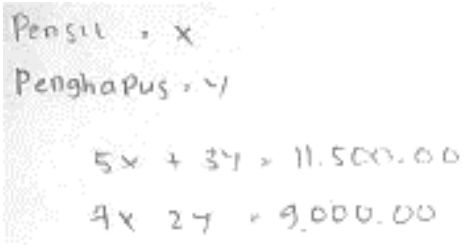
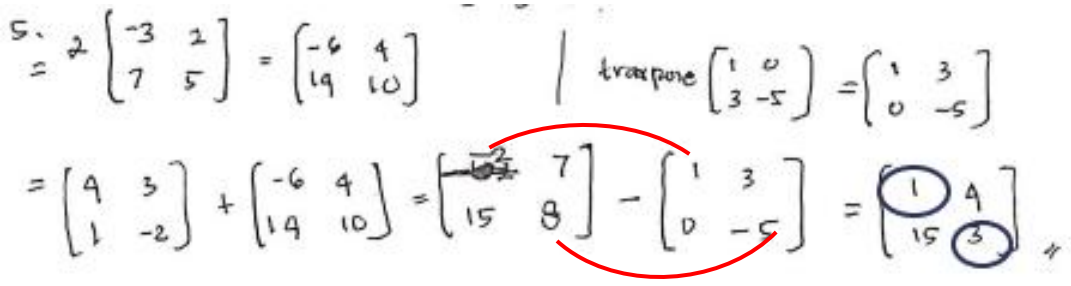


Figure 7. The student's answer to problem number 4

Based on Figure 7 it is evident that students can represent matrix concept in the form of an equation consistent with that which has been learned correctly. It means a student's error in presenting a concept in mathematical form is very low (Suraji, Maimunah, & Seragih, 2018). However, students implement it in the form of linear equations. Of all the students who worked on the problem, there were no students represented in the form of a matrix.

5. The indicator develops the requisite or requisite of a concept

Based on the chart 1 percent of the indicator of understanding of the fifth concept is 60%, meaning that students' ability to develop the necessary conditions or requirements of sufficient concepts falls into the low category. In this case, most students have not been able to develop the necessary conditions or sufficient requirements of a matrix concept that has been explained by the teacher. Here is the student inexact answer excerpt on problem number 5.



The student was incorrectly writing the operating result

Figure 8. The student's answer to problem number 5

Based on Figure 8 it looks like the students have not been able to properly complete the matrix operation. This is because students have been miscalculated in the process of summation and matrix reduction. One of the problems the student considers difficult is counting in solving a problem (Derfia et al., 2020). Whereas the ability a student must currently master is that of a student's ability to solve a problem (Domu, Manangin, & Pinontoan, 2022).

Based on the interview, this is because students are confused when faced with the question of an integer operation. Students also explain that a lack of understanding regarding the concept of operating Numbers is particularly on

negative integers. Whereas students should be able to properly operate mathematics, being the basis for learning the next mathematical material (Hoiriyah, 2019).

6. Indicators apply a mathematical procedure or operation in resolving problems

Based on the chart 1 percentage of the indicator of understanding the sixth concept 55% means that students' ability to implement a mathematical procedure or operation in solving problems falls in the low category. In this case, most students have not been able to implement the mathematical procedure or operation in solving the matrix problem that the teacher has described. This harmonizes with research by Yufentya, Roza, & Maimunah (2019) which also explains that there is the student's ability to select a procedure to be applied to problem math is not good. Here is an excerpt of the student's incorrect answer on problem number 6.

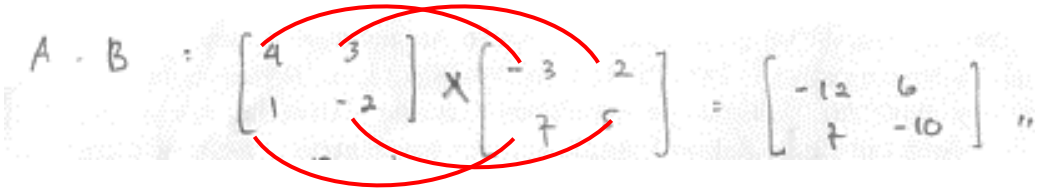


Figure 9. The student's answer to problem number 6

Based on Figure 9 it appears that students have not been able to implement the multiplication procedure on the matrix properly. Students multiply the elements in the matrix directly without using the appropriate proceduresStudents were experimenting with the same matrix element.

Through student interviews explain that forgetting the concept of multiplication on a matrix, thus using a common multiplication. In resolving a math problem, the majority of students do memorize the formula and do not understand the concept (Munasiah, 2021). This is often the cause of failure because of forgetting what is memorized.

7. Indicators apply concepts in resolving problems

Based on the chart 1 percent of the indicator of understanding of the seventh concept 60% means that students' ability to apply concepts to solving the matrix problem falls in the low category. Most

students have not been able to apply the concept of a matrix in resolving the problem according to what the teacher has described. Here is an excerpt of the student's incorrect answer on problem number 7.

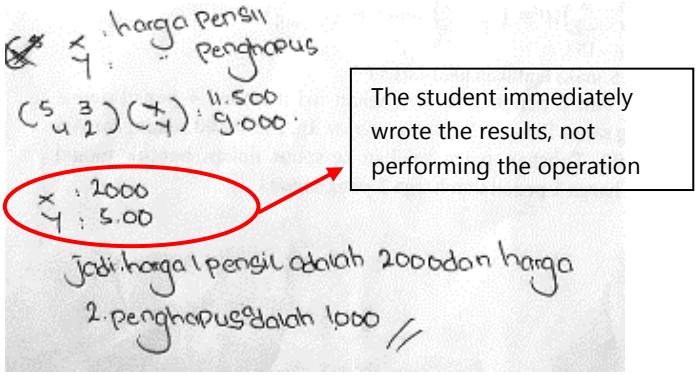


Figure 10. The student's answer to problem number 7

Based on Figure 10 shows that students are unable to apply the concept of solving problems correctly. In research, Derfia et al., (2020) also state the students' ability to apply a mathematical concept to low problem-solving. The student's miscalculation was that the student only wrote down the mathematical model without any calculating process. Students explained that the results contained are derived from estimates and trials. The student claims not to understand the concept of solving the story problem that relates to the matrix, hence writing only the mathematical model. Students are also confused and unsure about the multiplication matrix way.

CONCLUSION

The ability to understand the student concepts in each indicator is different. The percentage of the student's ability to understand concepts in the 1st indicator is 72%, at the 2nd indicator is 93%, at the 3rd is 83%, at the 4th is 88%, at the 5th is 60%, at the 6th is 55% and at the 7th is 60%. The percentage of the indicator of the ability to understand the student's highest concepts is that of representing a concept in various mathematical forms reaching 93%. On the other hand, the percentage of indicators for understanding students' lowest concept is that of applying a mathematical procedure or operation in solving problems at 55%.

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