

# **ANALYSIS OF STUDENTS' REASONING ABILITY IN AKM-ORIENTED PROBLEM SOLVING IN TERMS OF GENDER**

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## **Abstrak**

Penelitian ini bertujuan untuk menganalisis kemampuan penalaran siswa laki-laki dan perempuan dalam pemecahan masalah berorientasi AKM. Jenis pada penelitian ini merupakan penelitian deskriptif kualitatif dengan desain studi kasus. Subjek pada penelitian adalah siswa kelas VIII SMP Negeri 2 Sidoharjo. Pengambilan data dilakukan dengan melakukan tes dan wawancara terhadap siswa untuk memperoleh hasil dokumentasi yang berupa data dari hasil pekerjaan siswa. Pengujian kredibilitas data menggunakan teknik triangulasi. Reduksi data, penyajian data, dan penarikan simpulan dilaksanakan pada proses analisis data. Pada penelitian diperoleh data yang menyatakan keempat siswa dapat memenuhi indikator mengajukan dugaan dan indikator melakukan manipulasi matematika. Salah satu siswa perempuan juga dapat memenuhi indikator menyusun bukti dan memberikan dasar atau bukti dari beberapa kebenaran solusi dan indikator menentukan kesimpulan, sedangkan satu siswa perempuan lainnya juga memenuhi indikator memeriksa kebenaran dari suatu argumen. Satu dari dua siswa laki-laki memenuhi indikator memeriksa kebenaran dari suatu argumen dan menentukan pola dari gejala matematis untuk membuat generalisasi.

**Kata kunci:** AKM, gender, penalaran matematis

## **Abstract**

This research aims to Analyze the reasoning abilities of male and female students in AKM-oriented problem solving. This type of research is qualitative descriptive research with a case study design. The subjects of the research were class VIII students at SMP Negeri 2 Sidoharjo. Data collection was carried out by conducting tests and interviews with students to obtain documentation results in the form of data from the students' work results. Testing the credibility of the data uses triangulation techniques. Data reduction, data presentation, and drawing conclusions are carried out in the data analysis process. In the research, data was obtained which stated that the two female students were able to fulfill the indicators for making allegations and the indicators for carrying out mathematical manipulation. One female student can also fulfill the indicators of compiling evidence and providing a basis or proof of some truth of the solution and the indicator of determining a conclusion, while another female student also fulfills the indicators of checking the truth of an argument. For male students, both students can fulfill the indicators of making conjectures and the indicators of carrying out mathematical manipulation. One of the male students also met the indicators of checking the truth of an argument and determining patterns of mathematical phenomena to make generalizations.

**Keywords:** AKM, gender, mathematical reasoning

## **1. INTRODUCTION**

Mathematics is a science studied at all levels of education. Mathematics needs to be given to all students starting from elementary school to equip students with the ability to think logically, analytically, systematically, critically and creatively, as well as the ability to collaborate (Regulation of the Minister of National Education Number 22 of 2006 concerning content standards). One of the goals of learning mathematics according to the NCTM (National Council

of Teachers of Mathematics) is for students to be able to reason about mathematical patterns and properties, manipulate mathematics to make generalizations, assemble evidence or convey mathematical ideas and statements.

Reasoning can be interpreted as drawing conclusions from a statement and a way of thinking that can explain efforts to find connections between two or more things based on certain properties and laws whose truth is recognized (Mikrayanti, 2012). The OECD (Organization for Economic Cooperation and Development) through PISA (Program for International Student Assessment) reported in December 2023 that the assessment of Indonesian students' mathematical reasoning was ranked 66th out of 81 countries participating in the survey. One of the reasons why students' low mathematical reasoning abilities are lack of familiarity in solving problems that require unusual solutions or solutions that require deeper knowledge of the material in the problem, which for example can be found in PISA questions (Asdarina & Ridha, 2020).

Familiarizing students with reasoning questions that are equivalent to PISA questions is in line with the implementation of the Minimum Competency Assessment (AKM) in the implementation of student learning activities at school. Minimum Competency Assessment (AKM) is an assessment of the fundamental competencies needed by all students to be able to improve their personal skills and be able to apply them in social life (PUSMENDIK, Minimum Competency Assessment, 2022). By implementing AKM, students are expected to be able to improve their abilities in reading literacy and mathematics literacy. Reading literacy and mathematical literacy or numeracy literacy can help to improve students' reasoning abilities. The material in mathematics learning which is included in the domain of mathematical literacy includes material on numbers, geometry and measurement, algebra, and data and uncertainty.

Geometry is one of the domains of mathematical literacy in AKM. Geometry is a branch of mathematics whose learning aims to ensure that students are able to understand the properties and relationships between geometric elements in order to provide good solutions to given problems (Muslimin & Sunardi, 2019). Naja et al., (2021) in (Suyatno) stated that geometry material is still one of the materials that students consider difficult. Students' lack of understanding of geometry starts from students' lack of understanding of basic concepts. Students are also deemed unable to determine the characteristics of each shape that is included in the scope of geometry material.

Each student has their own level of ability in trying to understand the material provided. With differences in the abilities of each individual student, there may be differences in reasoning abilities between female and male students. According to research conducted by

Pandu (2019), it is stated that the two genders have different reasoning profiles in solving problems. Female students are able to fulfill all the reasoning indicators, while male students are only able to fulfill half of the indicators that female students are able to fulfill. Another research conducted by Prajono et al (2021), found that the percentage of results for the reasoning ability test for male students was 47.62%, while for female students the percentage was 52.38%.

Based on the background that has been written, this research was conducted to carry out an analysis of students' reasoning abilities in AKM-oriented problem solving, reviewed based on gender. The research was carried out at SMP Negeri 2 Sidoharjo by providing geometry material as a problem given to students.

## **2. METHOD**

The type of research in this research is qualitative descriptive research with a case study design. The research was carried out in August 2023 on class VIII students of SMP Negeri 2 Sidoharjo. Two female and two male students were selected as subjects in the research. Data collection techniques using tests, interviews and documentation. The results of the test can provide data on students' mathematical reasoning abilities. Interviews were conducted to determine students' knowledge of the material related to the questions given regarding students' mathematical reasoning abilities in AKM-oriented problem solving. Documentation in this research is in the form of data on the work of male and female students in solving mathematical reasoning problems.

The questions given during the test consist of two descriptive questions which are arranged based on indicators of mathematical reasoning according to the Director General of Basic Education No. 56/C/2024 Ministry of National Education, namely (1) Proposing allegations, (2) Carrying out mathematical manipulation, (3) Compiling evidence and providing basis or proof of some solution's truth, (4) Determining conclusions, (5) Checking the truth of an argument, and (6) Determining patterns of mathematical phenomena to make generalizations. According to Miles and Huberman, there are three techniques used in data analysis, namely data reduction, data presentation and drawing conclusions. Credibility testing is carried out by increasing persistence and triangulation of technical sources, and time

## **3. RESULT AND DISCUSSION**

### **3.1 Results**

#### **3.1.1 Mathematical Reasoning Ability Test Results for Male and Female Students**

The results of the work of male students (L) and female students (P) in completing the mathematical reasoning ability test show that each student has a different level of reasoning ability. The following is data on student work results:

**Table 1. Mathematical Reasoning Ability Test Results for Male and Female Students**

Student code	Question	Indicators of fulfilled reasoning
P1	1	<ul style="list-style-type: none"> <li>• Raise allegations</li> <li>• Perform mathematical manipulations</li> <li>• Checking the truth of an argument</li> </ul>
	2	<ul style="list-style-type: none"> <li>• Raise allegations</li> <li>• Perform mathematical manipulations</li> </ul>
P2	1	<ul style="list-style-type: none"> <li>• Raise allegations</li> <li>• Perform mathematical manipulations</li> </ul>
	2	<ul style="list-style-type: none"> <li>• Raise allegations</li> <li>• Perform mathematical manipulations</li> <li>• Organize evidence and provide a basis or proof of some truth of the solution</li> <li>• Determine conclusions</li> <li>• Determine patterns of mathematical phenomena to make generalizations</li> </ul>
L1	1	<ul style="list-style-type: none"> <li>• Raise allegations</li> <li>• Perform mathematical manipulations</li> <li>• Checking the truth of an argument</li> </ul>
	2	<ul style="list-style-type: none"> <li>• Raise allegations</li> <li>• Perform mathematical manipulations</li> <li>• Checking the truth of an argument</li> <li>• Determine patterns of mathematical phenomena to make generalizations</li> </ul>
L2	1	<ul style="list-style-type: none"> <li>• Raise allegation</li> <li>• Perform mathematical manipulations</li> <li>• Checking the truth of an argument</li> </ul>
	2	<ul style="list-style-type: none"> <li>• Raise allegations</li> <li>• Perform mathematical manipulations</li> </ul>

Picture 1. Data

### 3.1.2 Interview Results for Mathematical Reasoning Ability of Male and Female Students

#### 1) Female Student 1

Student are able to determine the method that will be used to solve the problem. So according to the answers given, students are able to fulfill the indicators of making allegations. Students are also able to fulfill the indicators of compiling evidence and providing a basis or proof of some truth of the solution and indicators of determining patterns of mathematical phenomena to make generalizations. However, students have not been able to fulfill the second indicator or the indicator of carrying out mathematical manipulation, the indicator determines conclusions and checks the truth of an argument.

#### 2) Female Student 2

Student can determine the method that will be used to solve the problem. So according to the answers given, students are able to fulfill the indicators of making allegations. Students are also able to fulfill the indicators of compiling evidence and providing a basis or proof of some truth of the solution, the fourth indicator or indicator determines the conclusion, indicators check the truth of an argument, and indicators determine patterns of mathematical phenomena to make generalizations. However, in the second indicator or indicator of carrying out mathematical manipulation, the answers given by students show that students are less able to determine the mathematical model of the questions given.

### 3) Male Student 1

Student can write down the meaning of the command in the question, so that according to the answer given, students are able to fulfill the indicators of making a guess. Students also fulfill the indicators of compiling evidence and providing a basis or proof of some truth of the solution, indicators of checking the truth of an argument, and indicators of determining patterns of mathematical phenomena to make generalizations. However, students have not been able to fulfill the indicators for carrying out mathematical manipulations and the indicators for determining conclusions

### 4) Male Student 2

Students can write down the meaning of the command in the question, then according to the answer given, the student is able to fulfill the indicators of making a guess. Students also fulfill the indicators of compiling evidence and providing a basis or proof of some truth of the solution and the indicators of determining patterns of mathematical phenomena to make generalizations. However, students have not met the indicators for carrying out mathematical manipulations, the indicators for determining conclusions and the indicators for checking the truth of an argument.

## **3.2 Discussion**

Based on the results of the analysis of the two female students, it can be seen that the two female students can fulfill the indicators of making conjectures and the indicators of carrying out mathematical manipulations, one of the students also mastered the indicators of compiling evidence and providing a basis or proof of some solution's truth, the indicators of determining conclusions and the other students also mastering the indicators of checking the truth of an argument. The difference in students' ability to fulfill the mathematical reasoning indicators can be caused, one of the reasons, is the students' ability to understand the questions.

Based on the results of the analysis of the two male students, it is known that both male students can fulfill the indicators of making conjectures, the indicators of carrying out mathematical manipulations, and one of the students also fulfills the indicators of checking the truth of an argument and the indicators of determining patterns of mathematical phenomena to create generalization. One of the reasons for the difference in results is the difference in students' abilities in carrying out arithmetic operations in the process of solving problems.

According to the results of research conducted by Prajono, *et al.*, (2021), female students can determine mathematical patterns, then make generalizations, and can draw conclusions from calculation results. The results of other research carried out by Salmina and Nisa (2018) show that female students tend to have superior reasoning abilities than male students. This causes the reasoning test scores of male students to tend to be lower compared to female

students.

Based on the results of the analysis of the two male students, it is known that both male students can fulfill the indicators of making conjectures, the indicators of carrying out mathematical manipulations, and one of the students also fulfills the indicators of checking the truth of an argument and the indicators of determining patterns of mathematical phenomena to create generalization. One of the reasons for the difference in results is the difference in students' abilities in carrying out arithmetic operations in the process of solving problems.

According to the results of research conducted by Salmina and Nisa (2018), male students are considered to be less careful, less thorough, and less confident in solving mathematical reasoning problems when compared to female students. Due to the various shortcomings of male students in working on these questions, the results obtained in completing the reasoning test were considered less than optimal. Other research conducted by Pandu (2019) states that male students are considered to have lower abilities to fulfill six reasoning indicators when compared to female students.

#### **4. CLOSING**

Based on the results of the research, it can be concluded that the two female students can fulfill the indicators for making allegations and the indicators for carrying out mathematical manipulation. One female student can also fulfill the indicators of compiling evidence and providing a basis or proof of some truth of the solution and the indicator of determining a conclusion, while another female student also fulfills the indicators of checking the truth of an argument. For male students, both students can fulfill the indicators of making conjectures and the indicators of carrying out mathematical manipulation. One of the male students also met the indicators of checking the truth of an argument and determining patterns of mathematical phenomena to make generalizations.

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