

Student Misconceptions in Solving AKM Numeration Problems at SMA Level Viewed From the Personality Differences of Extrovert and Introvert Students

Nisa Alawiyah Gunawan¹, Yandi Heryandi², Muhamad Ali Misri³
^{1,2,3}IAIN Syekh Nurjati Cirebon, Indonesia

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ABSTRACT

This study aims to analyze: (1) Knowing personality types, (2) Results from AKM Numeracy, and (3) Misconceptions about AKM Numeracy based on personality types based on student personality types. This type of research is descriptive qualitative research with a case study design. The data collection technique was done by giving personality questionnaires and AKM Numerical test questions. The results showed that: (1) The tendency of personality types in extroverted students was 36%, and the other 64% had introverted tendencies, (2) The results of completing the AKM Numeracy test had the highest percentage in the misconception category, namely 50.40%, 26.20 % understand the concept, and the other 23.20% do not understand the concept, (3) Misconceptions in AKM Numeracy based on student personality types, shows that the highest misconceptions are found in students with extrovert personality types, with an average percentage of 55.80%, while students with introverted personality types have a percentage of 51.25%. Factors causing these misconceptions include acquiring student answers, studying habits, and the learning media used.

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Corresponding Author:

Nisa Alawiyah Gunawan
IAIN Syekh Nurjati Cirebon, Indonesia
Email: nisaalawiyahgunawan@gmail.com

1. INTRODUCTION

Mathematics is a science that underlies technological development and is essential in developing human thinking power [1]. Mathematics learning needs to be given to all students from Elementary School (SD) to High School (SMA) to always equip students with the ability to think logically, analytically, systematically, critically, and creatively and work together. These competencies are needed so that students can have the ability to acquire, manage, and utilize information to face the future. According to the National Council Of Teachers Of Mathematics, the objectives of learning mathematics are increasing problem-solving, reasoning, communication, connection, and representation skills [2]. Much research

on transitioning from school to university mathematics has addressed students' epistemological and cognitive difficulties [3].

The mathematics taught in schools is called school mathematics which is at the elementary school (SD), junior high school (SMP), and high school (SMA) levels. Taking the perspective of learning psychology is a relevant question if all students have the same pattern of development of these variables or if students at risk of dropping out of school show poor development [4]. School mathematics is part of mathematics that is selected based on educational interests and the development of science and technology (IPTEK). The mathematics usually chosen for the education level is mathematics that can organize reasoning, shape personality, instill values, solve problems, and perform specific tasks. This makes school mathematics not the same as science mathematics because it has differences in the presentation of mathematics, the mindset of mathematics, the limitations of the universe, and the level of abstractness [4]. This change in mathematics education specifically emphasizes that learning mathematics can only occur when students discover something through authentic experiences, structured problem-solving procedures, and, finally, through interaction between students and/or teachers [5].

One of the ways the Indonesian government has improved the quality of human resources is the Regulation of the Minister of National Education (Permendiknas) Number 22 of 2016, which explains that in the learning process, it is required that students can participate actively and can provide proper space for creativity, initiative, and freedom following their interests, talents, and abilities. Psychological and physical development of students. All academic units are expected to inspire students so that the learning process can run fun and challenge students to learn new things. Students are required to be able to improve numeracy literacy skills, be able to build understanding, be able to solve problems, be able to work together, be able to build creativity, and be able to work by utilizing ICT (Information And Communication Technology) [6]. Improving students' numeracy literacy skills is the right way to fulfill the challenges in the current era of independent learning to prepare students to compete with other countries [7].

In 2019, the National Assessment (AN) replaced the National Examination (UN) [6]. AN does not replace the UN's position in assessing learning outcomes and student outcomes but replaces it in terms of evaluating and describing the quality of the education system in Indonesia. AN does not apply only based on the ability of curriculum materials or subjects as has been implemented in the National Examination, but AN will map out two minimum student competencies (AKM), namely in literacy and numeracy. The government inaugurated AKM intending to prepare students to face the 21st century with various skills that must be achieved [8]. Furthermore, the character survey is a benchmark for schools to provide feedback so that a school environment that implements Pancasila principles is created and helps students understand learning material.

To ensure that AKM can measure the competencies needed by students and is following reading literacy and numeracy, the AKM questions measure different content and topics, various contexts, and several levels of students' cognitive processes. The context used in AKM Numeracy is adapted from the PISA content domain, so the context domain in AKM Numeracy is also divided into four numbers, geometry and measurement, algebra and

data, and uncertainty. The cognitive level of numeracy mathematical literacy in AKM Numeracy is divided into three levels, namely understanding (Knowing), application (Applying), and reasoning (Reasoning) [8]. In AKM, the numeration context used is comprehensive so that students can recognize various positions of mathematics in students' daily lives. The use of context in AKM Numeracy is used to recognize the role of mathematics in everyday life [9]. The context in this AKM includes contexts close to the environment, society, culture, and science in students' daily lives [10].

The AKM Numerical Question here provides and puts forward a real and occurring problem. When solving a problem, each student has a different way of solving it, which depends on the mindset and personality of the student himself. Personality types here are divided into extrovert and introvert personality types, which have contradictory characteristics. This contradictory nature causes the mindset of students to solve problems, especially in solving AKM Numerical questions [11].

Within the scope of the school, of course, there are differences in interest, motivation, or personality between students. The three factors are positively correlated to the way of teaching and learning. In each class, groups of students actively ask questions, dare to express opinions and have good public speaking skills. However, it is undeniable that other students tend to be quiet, shy, and not confident enough to speak in front of the class. This is one form of behavioral difference that students own. Experts classify personality into several categories. Some classify personality categories into two main groups, namely the introvert personality category and the extrovert personality category [12]. The grouping of extrovert and introvert personality categories is based on differences in interactions, habits, responses, and communication of each individual in blending in with the surrounding environment. Not only that, but the personality category also defines the position of individual tendencies related to their reactions or behavior.

According to the data obtained from interviews with these students, it can be concluded that students with extroverted personality types prefer to socialize and work in groups in learning activities. Extrovert personality types are more enthusiastic when directly involved in social activities and will work better when involving others. Also, an extrovert is known as a flexible person and requires stimulation from the teacher during the learning process. This is different from students with introverted personality types. Introverted students prefer to study alone and are always individualistic. They prefer to solve their problems and have careful planning, and are very careful in making decisions. Also, an introvert is a calm, diligent individual who has a high ability to concentrate [13].

Student errors in solving math problems often occur. This is due to how students respond to what they get. According to the Ministry of National Education, mistakes are mistakes in actions that violate the law and so on [14]. Student mistakes in completing mathematics are related to what has been obtained in learning mathematics [15]. If teachers do not identify or correct these misconceptions during the learning process, these misconceptions can prevent students from learning new ideas or can be carried over to new material [16]. They have difficulty restating and presenting concepts in various forms of mathematical representation. The inability of students to solve math problems shows that they do not have an adequate understanding of the subject [17].

Mathematical misconceptions are the existence of a discrepancy between a concept that students and the actual concept of mathematics understand. Misconceptions or wrong concepts refer to concepts that do not follow the scientific understanding accepted by experts in that field [18]. Misconceptions in students generally can be in the form of initial concepts, errors, incorrect relationships between concepts, intuitive ideas, or naive views. In addition, usually, students who experience misconceptions make mistakes in using formulas, translating math problems, and calculating and applying concepts. As a result of this misconception will cause students to find it challenging to learn, weaken students' enthusiasm, and make students need a long time to understand learning material so misconceptions can hinder the learning process. Therefore, it is necessary to analyze or identify misconceptions in students so that teachers can diagnose the causes of misconceptions and obtain solutions to reduce misconceptions that occur in students. Several studies have focused on characterizing and developing the professional competencies required for mathematics teachers [19].

Various methods or techniques are used to identify misconceptions in students, including concept maps, multiple-choice tests accompanied by open reasons, written essay tests, diagnostic interviews, discussion in class, practice questions and answers, etc. This study analyzed data using the Certainty of Response Index (CRI) method, which aimed to identify misconceptions through the degree of student confidence in answering questions. This misconception analysis aims to minimize misconceptions so that other misconceptions do not arise due to previous misconceptions, for example, by developing appropriate learning designs [20].

Based on the background of the problem, it appears that students' misconceptions in solving math problems are deviations or incompatibility of students' completion with what has been determined or agreed on for the completion that is completed. Therefore, in this study, researchers wanted to know how the misconceptions that occur to students at the high school level in solving AKM Numeracy questions based on the Certainty of Response Index (CRI) method are viewed from differences in extrovert and introvert personalities.

2. METHOD

Research subjects are individuals, objects, or organisms used as a source of information for collecting research data. Arikunto [21] defines a research subject as an object, thing, or person who becomes the data place where the research variable is attached and the variable in question. The subjects in this study were students of class XI MIPA 3 at SMA Negeri 8 Cirebon consisting of 25 students. Subjects were selected using a purposive sampling technique because subjects were selected based on specific criteria or by considering certain characteristics of the sample or research subject. These criteria and considerations are based on the teacher's provisions and recommendations for the research object, namely implementing the AKM Numeracy test and students' misconceptions.

Misconceptions in this study are students' misunderstandings in understanding concepts not based on scientific information and explanations that experts have agreed upon. This misunderstanding is when solving problems related to AKM Numeration questions. Some misconceptions that generally occur in students include misconceptions

when using formulas, translating and making mathematical models, and calculation discrepancies. In addition, in this study, misconceptions can be caused by wrong answers given by students, and they are sure of these answers, correct answers but not sure, reasons given are wrong and sure, and uncertainty about the correlation between answers and reasons given. This study used the CRI (Certainty Of Response Index) instrument to discover these misconceptions.

Personality type is the difference and diversity of personality that a person has. In this study, students' personality types were extroverted and introverted. The division of extrovert and introvert personality types is seen as two different things. To determine the tendency of the two personality types, this study used Eysenck's Personality Inventory (EPI) instrument, which contains aspects of personality types.

Data collection techniques aim to obtain research data needed as research material. Data collection techniques used in this study are as follows:

1. The test is an instrument or tool to collect information about a person's knowledge or skills [18]. The test used in this study was the AKM Numeracy test at the high school level in class XI SMA Negeri 8 Cirebon.
2. A questionnaire is several questions or questions arranged systematically to be filled out by respondents. The questionnaire used in this study, namely the Eysenck Personality Inventory (EPI) questionnaire, was shown to determine the tendency of personality types possessed by class XI students of SMA Negeri 8 Cirebon.

A research instrument is a tool for collecting data [21]. In qualitative research, the instrument or research tool is the researcher himself. Qualitative researchers, as human instruments, determine the research focus, select informants as data sources, collect data, assess data quality, analyze data, interpret data, and make conclusions based on the results [19]. In addition to the researcher being the main instrument in research, a simple instrument will likely be developed; the instrument is expected to complement the data obtained. To collect the data obtained. To collect the data needed in this study, several instruments were used, including:

1. CRI (Certainty Of Response Index) test sheet on Numerical AKM
On the CRI test sheet for AKM Numeracy, 5 item items are adjusted to the indicators in the AKM Numeration material, namely Algebra, and Geometry. Where on the CRI test sheet at AKM Numeracy contains questions and several questions regarding the level of student confidence in the answers given, the reasons students answered the questions, and the level of confidence about correlations or relationships related to the answers and reasons chosen. This test sheet is used to analyze the magnitude of students' misconceptions.
2. Eysenck Personality Inventory (EPI) Personality Questionnaire
For student personality types, students who have introverted and extroverted personality types will be analyzed. The questionnaire used to determine this personality type is the Eysenck Personality Inventory (EPI) made by H.J Eysenck, which consists of 20 items to determine a person's extrovert-introvert tendency. In filling out the EPI personality questionnaire, respondents were asked to answer questions by selecting answers A or B that matched the respondent's experience. Each question on the EPI

personality questionnaire intends to determine the tendency of the respondent's personality type, namely introverted or extroverted personality types.

3. RESULTS AND DISCUSSION

3.1. Results

The personality test in this study used a questionnaire with 20 question items from 6 indicators to determine the tendency of extroverted or introverted personality types. The data obtained from the answers to the questionnaires were analyzed to find out the student scores obtained by the students for the answers to the 20 questions. Based on the results of the analysis of the answers to the questionnaire, the tendency for student personality types possessed by students in class XI MIPA 3 SMA Negeri 8 Cirebon can be seen in Table 1:

Table 1. Results of Analysis of Student Personality Types

Personality Type	The Number Of Students	Presentation (%)
Extrovert	9	36,00%
Introvert	16	64,00%

Furthermore, based on the teacher's observation of students who have extroverted and introverted personality types, each student's personality type is further analyzed to determine its characteristics in learning activities and solving mathematical problems. The results of the questionnaire can be seen in the following explanation:

1. For students who have an extrovert personality type, when viewed based on the aspect of personality type, students with this personality, on average, enjoy doing activities, and some other students have a habit of submitting assignments on time. In addition, students with this personality type like to socialize, interact with others, and have many friends. In learning activities, on average, students with extroverted personalities actively participate in learning, dare to ask questions, do questions in front of the class, and some often consult when experiencing difficulties in understanding the material. In addition, some students like to do assignments in groups by discussing math problems together. However, some students with extroverted personality types do not like tasks that require more concentration, are late in submitting assignments, and are less thorough in working on questions.
2. Based on the teacher's observations on students with introverted personality types, when viewed from the personality aspect, students with this personality type tend to dislike activities, are quiet, and do not like socializing and interacting with others. In learning activities, students with introverted personality types are, on average passive, lacking the courage to ask questions. When working on questions, students with introverted personality types, on average, do not like working in groups or tend to do their assignments individually. However, students with this personality, some other students have good responsibility for the task, submit assignments on time, and pay close attention to some of the concepts learned.

The data from the results of this study were obtained based on the results of the Numerical AKM test using the CRI (Certainty of Response Index), which totaled five questions according to the indicators on the Numerical AKM at the high school level. The questions consist of 4 levels according to the AKM Numeration standard at the high school level. Based on the results of the CRI-based AKM Numerical test, the problem-solving abilities of class XI MIPA 3 SMA Negeri 8 Cirebon can be grouped based on student understanding, namely the categories of understanding concepts (P), not understanding concepts (TP), and misconceptions (M). The grouping is based on scoring guidelines following the CRI (Certainty of Response Index) used. Understanding this concept was analyzed for all class XI MIPA 3 students to determine the average percentage of the three categories of understanding the concept. Research data can be seen in Table 2:

Table 2. Results of Analysis of Students' Understanding of Concepts

Category	Presentation (%)
Understand Concept	26,40%
Not Understanding Concept	23,20%
Misconceptions	50,40%

It can be seen that the test results using the CRI (Certainty of Response Index) on the AKM Numeration show that students' conceptual understanding in the category of misconceptions has the highest percentage of 50.40% of the number of students in class XI MIPA 3 SMA Negeri 8 Cirebon. In other categories, 26.40% understand the concept, and 23.20% do not.

The misconceptions in this study were analyzed based on the personality types possessed by students and based on the data obtained from the personality test and the Numerical AKM test results, explained in the previous discussion. Then these two data can be used to analyze the misconceptions experienced by students, more specifically based on the type of personality possessed by students.

The average percentage of misconceptions in the personality type of extrovert students is 55.80% for the category of misconceptions, 28.80% for the category of understanding concepts, and another 15.40% for the category of not understanding concepts.

The average percentage of misconceptions in the introverted student personality type is 51.25% for misconceptions, 25.00% for the category of not understanding concepts, and 23.75% for understanding concepts.

To find out more clearly the average percentage of misconceptions experienced by students in solving AKM Numerical questions based on student personality types, it can be seen in Figure 1:

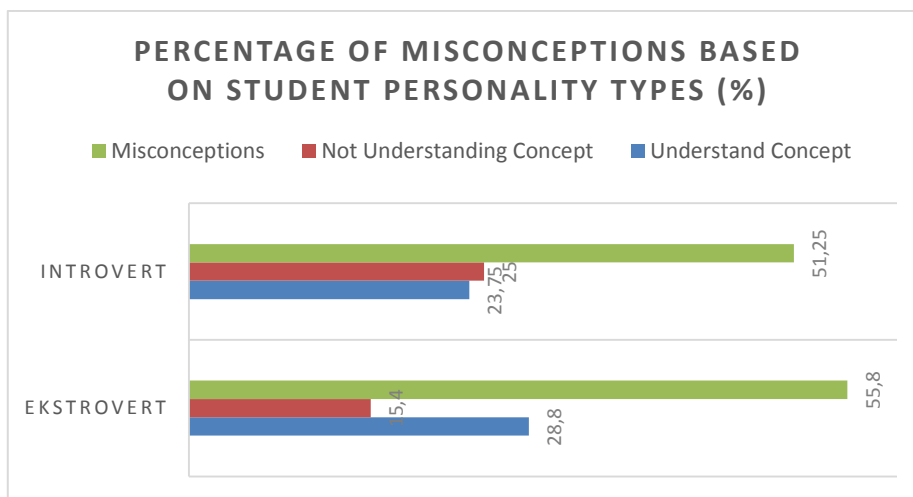


Figure 1. Student Misconception Percentage Chart

Figure 1 above shows that extroverted students have the most significant average percentage of misconceptions compared to students with introverted personalities.

3.2. Discussion

Personality type is an individual difference with characteristics and characteristics in behavior patterns and potential. Hans J. Eysenck distinguishes personality into two types, namely extrovert and introvert. Aspects of the extrovert and introvert personality types, namely activity, sociability, and expressiveness, are included in the personality questionnaire or Personality Test used in this study to determine student personality type tendencies [22]–[28].

Based on the results of the analysis of the research that has been done, it can be seen that students in class XI MIPA 3 SMA Negeri 8 Cirebon who have introverted personalities have a more significant number when compared to students who have extroverted personality types, namely there are 16 students or as much as 64%. At the same time, students with an extrovert personality type are nine or as much as 36%. This number is known based on an analysis of student's answers to the personality questionnaire. In addition, teacher observations show that students with both personality types have different characteristics in learning activities, such as participation in learning, activeness in class, courage, focus on understanding material concepts, responsibility for assignments, and joint learning activities. However, each student also tends to each aspect of a different personality type.

Students with an average extrovert tendency actively participate in learning, are brave in asking about material concepts that are not yet understood, can express their understanding orally, are happy to consult when some material is not understood, and like learning in groups. However, some students with extrovert personality types are less thorough in working on questions, understand concepts gradually, or are less able to understand concepts quickly, usually holding discussions with other students to understand the material. Meanwhile, students with an average introverted tendency have a character opposite of students with extroverted personality types.

In mathematics learning activities, students construct knowledge to develop problem-solving skills and abilities. To complete solving these problems, students must have a good understanding of concepts because understanding concepts in mathematics plays an important role and is the main goal in learning mathematics. In this study, an analysis of students' answers was carried out in solving CRI-based Numeracy AKM questions to find out students' conceptual understanding, which was grouped into three categories, namely Understanding Concepts (P), Not Understanding Concepts (TP), and Misconceptions (M).

The results of the analysis of the research that has been done, it can be seen that students' understanding of concepts in solving CRI-based Numeracy AKM questions is most prevalent in the category of misconceptions, with a percentage of 50.40%, 23.20% not understanding concepts, and 26.40 % the other understand the concept.

Based on the analysis of students' understanding of concepts, it shows that many students experience misconceptions. Misconceptions about understanding concepts that are not following actual scientific concepts, including that students experience misunderstandings when understanding, interpreting, and implementing a concept when solving a problem. When working on AKM Numerical questions, students are usually required to be able to reason and implement a concept. However, the reasoning of each student and the student's way of implementing a concept in AKM Numerical questions is different. These differences are also influenced by the type of personality they have. The diversity of personality types these students possess can affect misconceptions when solving AKM Numerical questions.

Based on the analysis in this study, it was found that students who had the highest average percentage of misconceptions were those with extroverted personalities, namely 55.80%, while students with introverted personality types had an average percentage of misconceptions of 51.25%. Several factors can cause student misconceptions apart from some things found in students themselves with their personality types, including learning methods, teachers, books, and the media used.

4. CONCLUSION

Based on the results of the research analysis conducted on students of class XI MIPA 3 at SMA Negeri 8 Cirebon regarding the analysis of misconceptions in AKM Numeracy in terms of student personality types, it was concluded that the personality types of students analyzed through answers to personality questionnaires or Personality Tests for class XI MIPA 3 students were the most many have introverted personality types, namely as much as 64%, and 36% others have extrovert tendencies. Students' AKM results were analyzed using the CRI (Certainty of Response Index), primarily found in the category of misconceptions, with an average percentage of 50.40%, 23.20% did not understand the concept, and the other 26.40% understood the concept. Misconceptions in AKM Numeracy based on student personality types shows the results of the analysis that the highest misconceptions are experienced by students with extrovert personality types, with an average percentage of 55.80%, while students with introverted personality types experience misconceptions with an average percentage of 51.25%. The average

misconception experienced by students in class XI MIPA 3 with the extrovert personality type is that it lies in the answers and the reasons chosen are not appropriate. However, the level of confidence in the answers is included in the high or sure category, while misconceptions in students with introverted personality types that is, it lies in the answers and reasons chosen are correct. However, the level of confidence in the answers is included in the low category or unsure by the teacher.

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