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Analysis of Student Mathematic Intelligence in Mathematic Learning Through the Problem Based Learning Model

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Abstract
This study aims to analyze: Students' mathematical logical intelligence after implementing a problem-based learning model. This research is a descriptive qualitative research. The subjects of this study were students of MAS Al-Washliyah Km.6 Medan Class XI-A, totaling 30 people, then the interview subjects were appointed based on the mathematical logical intelligence category and the dominant answer patterns in each category. The results of the study were as follows: Students' mathematical logical intelligence after applying the problem-based learning model found that out of 30 students there were 8 students who had high category mathematical logical intelligence, 12 students had medium category, and 11 students had low category. For each indicator, students have an average assessment of the numeracy ability indicator, namely the moderate category; indicators of reasoning and logical thinking, namely the medium category; and indicators of solving problems, namely the medium category. Students 'difficulties in completing students' mathematical logical intelligence tests a) in the high and medium categories, students have difficulty in principle criteria; b) in the low category, students have difficulty in the criteria for facts and principles.
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INTRODUCTION

According to Permendiknas number 22 of 2006, mathematics is one of the subjects studied by students starting from Elementary Schools, Middle Schools and even to Higher Education. This is intended to equip students with logical, analytical, systematic, critical and creative thinking and the ability to work together (Harahap, 2017). That is, students are expected to be able to use mathematics and mathematical thinking patterns in everyday life and in studying various sciences which emphasize structuring reasoning, forming student attitudes and skills in the application of mathematics. Students in mathematics learning are expected not to memorize the formulas, concepts, and procedures taught but to understand these concepts and to know where the formulas were obtained.

Coockroft (Abdurrahman, 2009: 253) suggests several reasons why mathematics should be taught to students, such as: (1) it is always used in all aspects of life; (2) all fields of study require appropriate mathematical skills; (3) is a strong, clear and concise means of communication; (4) can be used to present information in a variety of ways; (5) improve logical thinking skills, accuracy and spatial awareness; (6) give satisfaction to the effort to solve problem challenges. This is in line with the objectives of learning mathematics according to the 2013 curriculum (Kemendikbud, 2013) are (1) increasing intellectual abilities, especially high-level students 'abilities, (2) shaping students' abilities to solve problems systematically, (3)) obtaining high learning outcomes,

Even though mathematics is a highly efficient subject, most students are still less motivated in learning mathematics. They still think that mathematics is a difficult, difficult, and stressful subject. This is supported by the majority of mathematics teachers who appear less familiar or too serious. So that student motivation in learning mathematics is less than optimal. Students' mathematics learning outcomes are influenced by internal and external factors. Internal factors are factors that come from within students themselves, such as: motivation, emotional intelligence, logical-mathematical intelligence, self-confidence, independence, attitudes and others. While external factors are factors that come from outside the student, such as: facilities and infrastructure, environment, teachers, curriculum,

Both of these factors support each other. However, internal factors are more dominant in student learning success. These factors are logical-mathematical intelligence and learning independence. If these two elements can arise from students, the subject matter provided by the teacher will be easily accepted by students. So that students' mathematics learning outcomes will be good and the objectives of learning activities are achieved.

Simmers (Surya, 2017) said that mathematics often has difficulties. This can be seen from the results of the 2018 PISA study (OECD, 2018) where Indonesia was ranked 75th out of 80 participating countries, or in other words it was ranked the sixth lowest of all PISA participating countries surveyed with an average math ability of Indonesian students, namely 379, This is below the international average score of 458.3. Indonesian students still often have difficulty solving math problems.

The results of research from Rohayati and Surdita (Eviyanti, 2017), stated that less than 50% of students

still lacked confidence with symptoms such as feeling embarrassed when asked to come to the front of the class, feeling tense and afraid that suddenly came during the test, students were not sure of his ability so as to cheat even though basically the students have learned the material being tested, and are not enthusiastic when attending lessons in class and do not like doing homework.The results of Novferma's (2016) study state that the factors of difficulty experienced by students in solving math problems are students feel that the time given is not enough, give up easily, are less careful, often forget, feel anxious, and students are in a hurry to work on the questions. This event was clearly seen by researchers when making observations at MAS Al-Washliyah KM. 6 Pulo Brayan Medan.

One of the internal factors that influence learning is intelligence. One of the intelligences related to problem-solving abilities is mathematical logical intelligence. Mathematical logical intelligence includes mathematical calculations, logical thinking, problem solving, inductive reasoning and deductive reasoning, as well as acuity in patterns and relationships. With the element of problem solving in mathematical logical intelligence, of course it will affect students' mathematics learning achievement.

Mathematical logical intelligence is quite important for students and teachers. For students, it can encourage the enthusiasm of students to excel in learning and direct learning activities according to their needs. As for the teacher, by understanding and knowing the logical intelligence of students, the teacher will be able to raise, improve, and maintain the enthusiasm of students to succeed in learning, be able to adjust their teaching strategies according to the student's condition, and be able to position themselves in learning activities.

Intelligence or intelligence is an ability brought by an individual from birth that allows someone to do something in a certain way (Purwanto, 2013). Howard Gardner (2003: 23) defines intelligence as the ability to solve problems and produce products in a variety of settings and in real situations. The results of Gardner's research reveal that there are 9 intelligences possessed by each person, namely linguistic intelligence, mathematical-logical intelligence, visual spatial intelligence, kinesthetic-physical intelligence, musical intelligence, interpersonal intelligence, intrapersonal intelligence, naturalist intelligence and existential intelligence.

One of the intelligences according to Gardner (2003: 40) which is closely related to mathematics is mathematical logical intelligence. Mathematical Logical Intelligence is the ability related to the effective use of numbers and logic. Included in intelligence is sensitivity to logical patterns, abstraction, categorization, and calculation.

Mathematical logical intelligence is defined as the ability to use numbers well and do correct reasoning (Armstrong, 1999). This ability includes the ability to solve problems and create things with numbers and reasoning. Mathematical logical intelligence indicators are logical patterns that include deductive and inductive considerations, abstraction in problem solving, categorization, and mathematical calculations by paying attention to several aspects including estimating, calculating algorithms, interpreting statistics, and depicts visual information in graphical form (pictures).

According to Champbell (Novitasari, 2016), the types of logic in general are deductive and inductive logic. Deductive logic is a conclusion that follows the premises that have been stated. Deductive considerations begin with general rules and then attempt to prove the data are consistent with one generalization. Inductive logic is a conclusion developed step by step from specific to general. Inductive logic includes the general consideration of specific facts.

In addition, the indicators of mathematical logical intelligence, namely problem solving, is a mental process that is part of a broader problem process that includes finding and problem formation. Problem solving occurs when a condition requires a change from the reality being faced to the desired condition (Novitasari, 2016).

Mathematical-logical intelligence is a combination of numeracy and logical abilities so that students can solve a problem logically. Students who have high mathematical-logical intelligence tend to be able to understand a problem and analyze and solve it appropriately. Likewise, in mathematics learning activities, students who have high mathematical-logical intelligence have high learning outcomes. However, in reality there are still many students whose numeracy skills and logic are still not good enough. This can be seen when students are given story questions that need to be analyzed first. They cannot answer these questions because they cannot identify the problems in these questions (Suhendri, 2017).

Kamsari (2018), concluded that the ability of students in the problem solving process is still low at the stage of exploring and planning and reflecting and developing for each level of intelligence This is in line with the opinion of Aziz (Kamsari, 2018) in his research which states that most students do not hone mathematical logic intelligence, thus making it difficult for students to solve and solve given problems. Whereas basically every individual can develop the intelligence they have. This can happen because the students themselves are lazy to hone it, or also because the surrounding environment is less supportive for students to develop this intelligence.

Based on the results of research by Sastyawati (Susanti, 2018) students who have low mathematical logical intelligence, where the ability to think logically, mathematical calculations and algebraic operations is less, causing in answering structured questions, they do not understand and are confused about the meaning of the

question.

Mujiani (2016) states that mathematics is a logical way of thinking that is presented in numbers, space and form with existing rules that cannot be separated from everyday life. But in reality, not all students who have high mathematical logical intelligence will have high mathematics learning outcomes. In his research, Yanti (2018) concluded that mathematical logic intelligence is the ability to process numbers, think logically and naturally and can solve simple problems in everyday life.

As is well known, mathematics is a field of study that plays an important role in education. The implementation of mathematics in everyday life is widely used both for mathematics itself and for the application of other sciences. Mathematics has an important role in the learning process in order to train the ability to think systematically, logically, critically, creatively, and consistently in solving problems. The implementation of learning in front of the class is not enough to equip students with a variety of knowledge about mathematics, but more than that, real efforts are needed to be carried out intensively to develop students' thinking skills, including problem solving (Librianti, 2015).

One of the teachers' efforts to improve the learning process is to choose the appropriate and innovative learning model in mathematics learning. However, the reality in the field is based on the results of interviews with mathematics teachers at MAS Al-Washliyah Km.6 Medan, teachers still use conventional learning models when teaching which makes learning less meaningful. This means that in the learning process students do not experience firsthand how the mathematics process is. Teachers still exist to the paradigm of transfer of knowledge in learning, where teachers simply transfer their knowledge and do not give students the opportunity to explore their mathematical abilities so that students are sometimes not given the opportunity to develop their abilities.

According to Ebbut and Straker (Sutama, 2011), school mathematics has four characteristics, namely: (1) pattern and relationship tracing activities; (2) creativity that requires imagination, intuition and discovery; (3) problem solving activities; and (4) means of communication. From Ebbut and Straker's statement, the characteristics of school mathematics require teachers to be creative and anticipatory about the effectiveness of learning mathematics in school. In fact, the teacher has not been able to show these mathematical characteristics in the mathematics learning process at school. Ansari (2016) explains about the conditions of the school in the mathematics learning process, namely: (a) In teaching the teacher often gives an example to students how to solve problems; (b) students learn by listening and watching the teacher do mathematics, then the teacher tries to solve it by themselves; and (c) when teaching mathematics, the teacher immediately explains by giving examples, and questions for practice.

The conditions above illustrate that learning that is carried out is teacher-centered learning, the teacher dominates the learning so that student involvement in the learning process is still lacking. As a result of school conditions in the learning process of mathematics, it shows the limitations of teachers in presenting the characteristics of mathematics so that the abilities expected for students to be able to face the development of science and technology are not obtained.

Good learning is learning that develops the way students learn actively in the process. This statement is in accordance with the opinion of Chrissanti and Widjajanti (Simatupang, 2019: 15) which states that students must be able to take the initiative and involve themselves actively in learning mathematics. Thus there will arise a good interaction between teachers and students in the learning process, so that students are no longer the object of learning but the center of learning activities.

In response to this, many innovative learning models have been applied in mathematics learning. One of the learning models suggested in the implementation of the 2013 curriculum is the Problem Based Learning (PBL) model. The PBL model has characteristics, namely: (1) learning begins with a problem, (2) ensures that the problem given is related to the real world of students, (3) organizing lessons around the problem, not around the discipline, (4)) giving great responsibility to learners in forming and directly carrying out their own learning process, (5) using small groups, and (6) requiring learners to demonstrate what they have learned in the form of a product or performance (Ngalimun, 2013).

However, in practice the problem-based learning model still faces obstacles such as: there are still many students who have difficulty understanding problems, students still find it difficult to carry out investigations individually or in groups for abstract concepts, and students have difficulty determining the problem. solution to a given problem. In fact, it is difficult to apply it just like that without preparation, both in terms of the problem formulation itself, the teacher's actions to facilitate students, and the effective student mindset to be able to solve math problems well (Ngalimun, 2013).

The relationship of problem based learning (PBL) to logical intelligence can be seen from the following research results. The effectiveness of PBL is proven by Prayogi (Putra, 2019), in his research entitled Implementation of the PBL (Problem Based Learning) Model to Improve Student Learning Outcomes and Critical Thinking Ability. The conclusion of this research is that the implementation of the PBL (Problem Based Learning) model can improve student learning outcomes and critical thinking skills. Data taken from

observations made at SMP Muhammadiyah Aimas in September 2017 (Astutik, 2019) shows that SMP Muhammadiyah Aimas is still using the 2006 Education Unit Level Curriculum (KTSP) with the level of completeness of mathematics scores, especially class VIII, is still very low,

Based on the description above, researchers are motivated to conduct research with the title "Analysis of Students' Mathematical Intelligence in Mathematics Learning through Problem Based Learning Model".

THEORITICAL REVIEW

Understanding Learning Model

A teaching approach with strong experiential learning content, encourages deep learning and provides superior learning outcomes (Kolb, 2015). Therefore, the learning model plays a very important role in teaching and learning activities, where the teacher can choose the right model for a material.

Strategy according to Kemp (Rusman, 2012: 132) is a learning activity that must be done by teachers and students so that learning objectives can be achieved effectively and efficiently.

Joyce and Weil (Rusman, 2012: 133) argue that the learning model is a plan or pattern that can be used to form a curriculum (long-term learning plans), design learning materials, and guide learning in class or others.

The learning model can describe the procedure for organizing the learning experiences of students to achieve certain learning goals. The learning model is also a guide and reference for teachers to design learning activities to be carried out.

Problem Based Learning Model (PBL)

According to Dewey (Trianto, 2011: 91) problem-based learning is the interaction between stimulus and response, which is the relationship between the two directions of learning and the environment. Where the environment plays a very important role in the student learning process. The environment provides a stimulus to students in the form of assistance on how to solve problems and also provides new problems to solve.

Margetson (Rusman, 2011: 230) says that the problem-based learning model (Problem Based Learning) helps to improve the development of lifelong learning skills in an open, reflective, critical, and active learning mindset, and facilitates successful problem solving, communication , work. groups, and better interpersonal skills than other models. Margeston's statement is reinforced by the statement of Boud and Feletti (Rusman, 2011: 230) which states that the problem-based learning model (Problem Based Learning) is the most significant innovation in the world of education.

Problem Based Learning (PBL) is an efficient method of facilitating the development of independent learning skills through structured problem solving strategies (D.Centea, 2017).

Problem Based Learning focuses on organized learning experiences by finding and solving problems that exist in the real world (Linda and Sara, 2002: 15).

Arends (2008b: 41) states that the problem-based learning model is a learning model in which students work on authentic problems with the intention of compiling their own knowledge, developing inquiry and higher order thinking skills, developing independence and self-confidence. This is strengthened by Tan's statement (Rusman, 2011: 232) which states that problem-based learning is the use of various kinds of intelligence needed to confront real-world challenges, the ability to face everything new and the existing complexities.

According to Pehkonen (2007), "problem solving has been one of the general goals overall in the finished curriculum". According to Pehkonen, problem solving has become one of the overall general objectives of the Finnish curriculum.

According to Polya (Eviyanti, 2017) there are four stages in solving problems; (1) understanding the problem: in this activity we find out what is known, what is asked, whether the information is sufficient, what conditions must be met, then restate the existing information in a more operational manner. (2) planning solutions; (3) carry out problem solving; (4) re-evaluate the results of problem solving.

Mathematical Logical Intelligence

Logical mathematical intelligence is one of the eight intelligences possessed by students, but in different degrees. There may be students who have high, medium and low mathematical logical intelligence. This intelligence is related to students' skills in performing mathematical operations. So far, in the teaching and learning process, the teacher has actually paid attention to the level of intelligence possessed by students, but teachers are more likely to immediately complete the learning material, so that students with low intelligence levels will be left behind in learning .

According to Saifullah (2004: 30) that mathematical logical intelligence is the ability to use numbers well and do reasoning correctly. Intelligence includes sensitivity to logical patterns and relationships, statements and propositions (if-then, cause-effect), logical functions and other abstractions. The processes used in mathematical logical intelligence include: categorization, classification, drawing conclusions, generalization, calculation, and hypothesis submission.

According to Linda Champbell (2006: 40) mathematical logical intelligence involves many components: mathematical calculations, logical thinking, problem solving, deductive and inductive considerations, and the acuity of patterns and relationships. According to Budinigsih (2005: 114) mathematical logical intelligence is often called scientific thinking, including deductive and inductive thinking. Where mathematical logical intelligence is a scientific thought process in solving a problem based on logical truth.

According to Lwin (2008: 43) mathematical logical intelligence is the ability to handle numbers and calculations, logical and scientific patterns and thinking. Meanwhile, according to Gardner (Suhendri, 2017) mathematical logical intelligence is a scientific reasoning ability. Mathematical calculations, logical thinking, inductive / deductive reasoning, and the acuity of abstract patterns and their relationships. Can also be interpreted as the ability to solve problems related to mathematical needs as a solution.

Based on some of the opinions above, it can be concluded that mathematical logical intelligence is the ability to calculate mathematically, think logically, reason scientifically, acuity in abstract patterns and relationships.

Every child has a different personality so that they have different abilities and intelligence. Mathematical logical intelligence has several special characteristics that distinguish it from other intelligences. This can be seen from the habits that children do from an early age.

In other words, a student is said to have good mathematical logical intelligence if the student has the following characteristics: intelligent, creative, dynamic, innovative, independent, critical, communicative, disciplined, and responsible.

In learning activities, especially mathematics, it is favored to use learning methods that can lead to or improve mathematical logical intelligence.

According to Saifullah (2004: 38) states that there are four forms of mathematics learning methods that can improve mathematical logical intelligence, namely:

1. Experimental method

This learning activity emphasizes an innovative, creative, independent, and responsible attitude.

2. Question and answer method

This learning activity emphasizes the critical, intelligent, and communicative attitude of students.

3. Problem solving method through logic puzzles.

This learning activity emphasizes the intelligent attitude and logical thinking skills of students. This means that students are given questions to analyze a problem in the form of essays or multiple choice questions. These questions consist of several statements that require students to find a final conclusion. This activity is carried out in the classroom by giving individual tests.

4. Methods of practicing arithmetic problems

This learning activity is the same as the method of solving problems through logic puzzles. The difference lies in the test question material. In this test question includes algebraic counting material, both in the form of addition, subtraction, multiplication, division, power and square root. This test emphasizes a smart attitude and can solve problems quickly and precisely. This activity is carried out in class through giving individual tests.

Difficulty Learning Mathematics

Learning difficulties are a condition that causes students not to learn properly. According to Sabri (in Widdiharto, 2008: 3) learning difficulties, namely the difficulty of students in receiving or absorbing lessons at school. Learning difficulty is a condition where the competence or achievement is not in accordance with predetermined standard criteria

Learning difficulties are often experienced by every student. Some responses from students when asking from various studies taught at school, mathematics is a study that is considered the most difficult by students, both those who do not have learning difficulties and especially those who have learning difficulties (Hodiyah, 2009: 3). This shows that there are students who have learning difficulties and also emphasize that many students think that mathematics is difficult.

Damerow (1984: 6) says that the existence of misunderstandings increases the inherent difficulties in mathematics, such as the manifestation of mathematics in concrete situations that are difficult for many students to understand. On the other hand, it has been found that children who fail at school can still do authentic math activities

Students with high, medium, and low math abilities when reading questions are still relatively slow, many words are missing (Kania: 2017: 68). Students with moderate and low math abilities still have difficulty adding, subtracting, dividing, and multiplying numbers. The learning process of mathematics which students feel is less pleasant is strengthened by the teacher's statement that so far they have not used a varied and appropriate learning model, due to difficulties in its use and application.

Hughes (2003: 113) suggests problems that may occur in children's difficulties with arithmetic. First we will look at the difficulties students have to understand operations in mathematics which are presented in unreal

problems and real problems (concrete). Second, we will look at students' difficulties in finding ways to solve existing problems. And the third, we will see how students represent the problem.

In order to help children have difficulty learning mathematics, teachers need to understand the common mistakes children make in completing math tasks. According to Lerner (in Widdiharto, 2008: 6), these deficiencies include an understanding of: symbols, place values, calculations, use of wrong processes, and illegible writing.

The following table describes the indicators of difficulty according to Lerner (in Made, 2015: 4) as presented in Table 1 below.

Table 1 Indicators of Difficulty Solving Problems

No.	Indicator
1	Difficulty learning concepts
2	Difficulty applying skills
3	Difficulty solving problems

(Made, 2015)

Lerner (in Abdurrahman, 2003: 78) suggests that the mathematics curriculum should include three elements, namely concepts, skills and problem solving. To find out students' mathematics learning difficulties, the teacher can analyze the essay test that the students undertake in terms of mastery of the three elements in mathematics studies which include understanding concepts, skills, and problem solving.

Concept refers to basic understanding. Students develop a concept when they are able to classify or group objects or when they can associate a name with a certain group of objects, for example, children recognize the concept of a triangle as a plane surrounded by three straight lines. According to Darjiani (2015: 1) indicators of mathematical difficulties in concept elements, namely (1) difficulty in determining a formula to solve a problem. (2) students in using the formula are not in accordance with the prerequisite conditions of the formula or do not write down the formula.

Skills refer to something someone does, for example: the process of using basic operations in addition, subtraction, multiplication and division is a type of mathematical skill. A skill can be seen from the child's performance well or not well and sooner or later. Skills tend to develop and can be improved through practice. According to Darjiani (2015: 1) an indicator of mathematical difficulties in the skill element is the difficulty of using basic operations in addition, subtraction, multiplication, division, calculation of roots and squares.

Problem solving is the application of concepts and skills. In problem solving usually involves some combination of concepts and skills in a new situation or a different situation than before. For example, when participants are asked to measure the area of a board, several concepts and skills are involved. According to Darjiani (2015: 1) indicators of mathematical difficulties in problem solving elements, namely students cannot continue their work in solving problems as well as external factors which include teacher factors and environmental factors.

Most students still have difficulty applying formulas, understanding theorems, even most of all students still have difficulty understanding problems in a math problem (Sholihah & Afriansyah, 2017: 151). Based on research conducted by Yeo (Sholihah & Afriansyah, 2017: 151) in Singapore which examines the difficulties experienced by grade IX students in solving math problems, it is stated that the difficulties experienced by students when solving math problems are difficulties in: (a) understanding the problems that are is given (lack of comprehension of the problem posed), (b) determines the correct solution strategy (lack of comprehension of strategy knowledge), (c) makes mathematical models (inability to translet the problem into mathematical form), and (d) perform inability to use the correct mathematics. According to Slameto (in Sholihah & Afriansyah, 2017: 151) "These difficulties can be caused by two factors: internal factors such as physical, psychological, and fatigue, and external factors, namely family, school, and the community environment".

RESEARCH METHODS

This type of research used in this research is descriptive qualitative research. Denzim and Lincoln (in Moleong, 2017: 5) state that "qualitative research is research that uses a natural setting, with the intention of interpreting phenomena that occur and are carried out by involving various existing methods". This research has been conducted at MAS Al-Washliyah Km.6 Medan with the subject, namely students of class XI-A, amounting to 30 students. Subject taking criteria are based on the dominant answer pattern in each category of students' mathematical logical intelligence. The object of this research is students' mathematical logical intelligence through the application of a problem-based learning model. The research instrument was a mathematical logical intelligence test and interview guide. Data analysis was performed using the Miles and Huberman model.

RESULTS AND DISCUSSION

The purpose of this study was to analyze mathematical logical intelligence and students' self-confidence through the application of a problem-based learning (PBL) model inclass XI-A Mas Al-Washliyah Km.6 Pulo

BrayanField. The problem based learning model is applied to the research class because schools still use conventional learning models. The research class is also not used to doing mathematical logical intelligence exercises, so before data collection is carried out, the class is conditioned on the application of mathematical logical intelligence questions through a problem-based learning model. The application of the problem based learning model in this study aims to help students plan problem solving, so that they are able to solve problems related to mathematical logical intelligence. Therefore, the learning tools used are based on a problem-based learning model and are valid based on expert validation. This research was also conducted by using a valid, reliable research instrument, with a distinguishing power and a level of difficulty based on expert and empirical validation (statistical calculations).

The students' mathematical logical intelligence test was attended by 30 students who had followed the learning using a problem-based learning model. The analysis of mathematical logical intelligence of class XI-A students was carried out by analyzing the results of students' mathematical logical intelligence tests and the results of interviews. Mathematical logical intelligence, each categorized into high, medium or low ability. Subjects to be interviewed were selected based on the results of students 'mathematical logical intelligence tests which were dominant in each category of students' mathematical logical intelligence.

Data analysis of students' mathematical logical intelligence test results and self-confidence scale, as well as interview results, was carried out using data analysis steps according to Sugiyono (2016: 247), namely "data collection, data reduction (data reduction). , presentation of data (display data), and drawing a conclusion ". Data collection activities in this study were to collect all the data needed in the form of mathematical logical intelligence test results and student self-confidence scales that matched the selected subject, then rewrite the results of the interview activities which were still in the form of audio into written form to make it easier. in analyzing.

Data reduction in this study is to simplify the results of the interview into a good structure and get rid of some unnecessary things. The presentation of the data in this study includes a description of the results of the mathematical logical intelligence test and self-confidence questionnaire, as well as the results of the interview. Drawing conclusions in this study was carried out by triangulationAmong the results of the mathematical logical intelligence test and self-confidence scale, as well as the results of the interview.

Implementation of the Learning Process

Learning activities were carried out four times in class XI-A at MAS Al-Washliyah KM.6 Pulo Brayan Medan, totaling 30 students. Activities began with learning carried out using a problem-based learning model with linear program material, then given a mathematical logical intelligence test of students. Learning uses learning tools, namely Learning Tool Plans (RPP) and Student Activity Sheets (LKPD) which are arranged based on a problem-based learning model.

Student Activity Sheets (LKPD), which are arranged based on a problem-based learning model, require students to solve problems in the LKPD by discussing with a group of friends and being guided by the teacher only as necessary. Furthermore, students will discuss to solve all the problems on the Student Activity Sheet (LKPD). After they have finished working on the questions according to the predetermined time, then the group representatives come forward to present the results of their group discussions in front of the class.

Students 'mathematical logical intelligence is obtained based on the scores obtained by each student in completing students' mathematical logical intelligence tests. The mathematical logical intelligence test instrument for students is arranged in the form of a description test with linear program material consisting of five questions which include three indicators of mathematical logical intelligence in the form of (1) numeracy skills, (2) reasoning and logical thinking, and (3) problem solving. The results of the instrument trial showed that the five questions were declared valid, reliable, there was differentiation and difficulty level, so that the test instrument could be used to determine students' mathematical logical intelligence. The implementation of the students' mathematical logical intelligence test was held on Saturday, December 12, 2020 for 90 minutes.

The results of the students' mathematical logical intelligence tests were collected for examination and given a score. The score for each student's answer is given based on the guidelines for scoring the students' mathematical logical intelligence which have been determined in the research methodology. To obtain the value of each student is done by adding up all the scores obtained on the student's answer sheet, then converted into a value range of 0-100. The scores obtained are categorized into the categories of students' mathematical logical intelligence, namely high, medium, or low.

The table shows the results of a mathematical logical intelligence test after being given learning using a problem-based learning model as follows:

Table 2 Results of Students' Mathematical Intelligence Test

No.	Value Interval	The number of students	Percentage	Rating Category
1	80 ≤ KLMS ≤ 100	8	26.67	High
2	65 ≤ KLMS <80	12	40	Moderate
3	0 ≤ KLMS <65	10	33.33	Low
The highest score		100.00		
Lowest Value		25.00		
Range		75.00		
Average		67.31		
Standard deviation		21.37		

Information: KLMS = Students' Mathematical Logical Intelligence

Based on Table 2, it can be seen that the level of mathematical logical intelligence of students with high-ability categories is 8 people (26.67%), 12 students with moderate ability (40%), and 10 students with low abilities (33.33%). .

From the table it can be seen that the value interval is 80 ≤KLMS≤ 100 or high category, there are 8 students. These results indicate that there were 8 students who were able to complete almost all the tests given well. From the results of the answers made by the students, it turned out that the students had worked on all the questions given by answering 1 question correctly and completely so that they got a perfect score, but for 4 questions were done correctly but there were a few errors in the processeach question obtainsimperfect value. In another case, there were students who did 5 questions correctly but there were still a few errorseach question is obtained imperfect value. However, when the student scores were accumulated in the range 80 ≤KLMS ≤ 100 who are in the high category.

For students who have a score of 65≤ KLMS <80 or in the moderate category there are 12 students who are generally able to solve 3 questions done correctly but there are a few errors so that each question does not get a perfect score and 2 questions have some errors in the process so that low value but still above half the perfect score. In another case, there were students who completed 2 questions that were done correctly but there were a few errors so that each question did not get a perfect score and the other 3 questions had several errors so that each question received a low score but was still above half the perfect score, but when accumulated the value obtained is in the range of 65 ≤ KLMS <80 which is in the medium category.

For students who have The value is 0 ≤ KLMS <65 or in the low category, there are 10 students who are generally only able to solve 2 questions with several errors so that each question gets a low score but is still above half the perfect score and 3 questions have a lot of errors so that each question gets a little score. In addition, there were also students' answers that contained many mistakes for all the question numbers, so that the scores obtained in the range 0≤KLMS <65 were accumulated which were in the low category.

Apart from that it was obtained that the highest score100.00 and the lowest value is 25.00 so that value range of 30 students namely 75.00. This shows that the difference between only the answers of students with the highest score and the lowest score is only 3 questions. However, if it is seen from the standard deviation (21.37) that the average mathematical logical intelligence between one student and another is not up to 1 question. This shows that the difference between students and other students is still acceptable.

Table 3 Percentage of Each Indicator of Mathematical Logical Intelligence

Reasoning Indicators	Average Percentage of Value
Ability to Count	66, 94
Reason and Think Logically	67.67
Solve the problem	67.17

In Table 3 it can be seen that for each indicator, students have an average assessment of the numeracy ability indicator of 66.94%, which is in the medium category. That is, students are capable of calculating operations to solve a given problem with minimal errors. Indicator of reasoning and logical thinking 67.67%, namely in the medium category. This means that students are able to work on or solve a problem by doing mathematical manipulation with few errors. Indicators solve problems 67.17%, namely in the medium category. That is, students are able to solve math problems with few errors.

The analysis of students 'difficulties in completing mathematical logical intelligence tests was obtained from the results of students' mathematical logical intelligence tests and interviews which were associated with student difficulty criteria, namely (1) concepts, (2) skills, and (3) problem solving.

Based on the results of students 'mathematical logical intelligence tests which have been categorized into the category of students' mathematical logical intelligence and the dominant answer pattern, from the 30 students, 2 students were selected with high-category logical mathematical intelligence, 2 students with mathematical logical intelligence, students were in the medium category and 2 students with intelligence. mathematical logic of low category students as a subject that was analyzed qualitatively.

Student difficulties in completing the mathematical logical intelligence test of students have three criteria, namely concepts, skills, and problem solving. For the high and medium category of mathematical logical intelligence of students, students have difficulty in concept criteria, namely students in using formulas that are not in accordance with the prerequisite conditions for the application of the formula or not writing the formula. For the low category of students' mathematical reasoning abilities, students experience difficulties with concept criteria, namely students using formulas that are not in accordance with the prerequisite conditions for the application of these formulas or not writing formulas, problem solving criteria are students who do not continue their work in solving problems because they cannot combine concepts and skills in a new situation or a different situation than before.

CONCLUSION

From the results of the analysis and discussion, the following conclusions were obtained:

1. Students' mathematical logical intelligence after applying the problem-based learning model found that out of 30 students there were 8 students who had high category mathematical logical intelligence, 12 students had medium category, and 10 students had low category. For each indicator, students have an average assessment of the numeracy ability indicator, namely the moderate category; indicators of reasoning and logical thinking, namely the medium category; and solve the problem that is in the medium category.
2. Students 'difficulties in completing students' mathematical logical intelligence tests are as follows:

a. In the high and medium categories, students have difficulty with concept indicators.
b. In the low category, students have difficulty in concept indicators and problem solving.

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