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Development of Diagnostic Assessment to Identify Students' Problem-Solving Abilities In Terms of Interest In Learning Mathematics

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Abstract

This research aims to produce a diagnostic assessment instrument for identifying students' problem-solving abilities in terms of their interest in learning mathematics in the form of essay questions. This research is Research & Development (R & D) research using the Tessmer development model, which is known as the formative evaluation type. Tessmer development consists of 4 stages, that is preliminary, self-evaluation, prototyping stage (expert reviews, one-to-one and small group) and field tests. The student response questionnaire on the diagnostic test instrument met the criteria achieved, and no improvements/revisions to the test instrument will be developed because more than 70% of students gave positive responses. From the results of the student response questionnaire, it can be seen that this diagnostic test instrument product can be said to be practical to use. The results of the diagnostic test data to identify students' problem-solving abilities in terms of their interest in learning mathematics it can be seen that the number of students in the high interest in learning category who meet the Understanding Problem indicator is 60%, the percentage of students who fulfil the Devising a Plan indicator is 50%, The percentage of students who fulfil the Carrying Out The Plan indicator is 50%. Only 30% of students fulfil the Looking Back indicator. Students with a medium interest in the learning category, the Understanding Problem indicator of 40%, the percentage of students who fulfil the Devising a Plan indicator is 20%, the percentage of students who fulfil the carrying out the plan indicator is 20%, and only 15% of students fulfil it. Looking back, indicator. Moreover, in the low interest in learning category, which meets the Understanding Problem indicator of 25%, the percentage of students who fulfil the devising a Plan indicator is 10%, the percentage of students who fulfil the carrying out the plan indicator is 10%, and only 0% of students fulfil the looking back indicator. Based on the results of students' work in answering diagnostic tests, it can be said that this test instrument product is quite effective in identifying students' problem-solving abilities in terms of their interest in learning mathematics.
Keywords: *Diagnostic Assessment; Problem Solving; Interest*

1. Introduction

In everyday life, someone definitely experiences problems. For every problem experienced, of course, someone hopes to find a solution. According to Khan, S., Hafeez, A., & Saeed, M. (2012), problems that occur in life definitely have the right solution, that is skills, but only a few people have them. Archer, L. A. C & Ng, K. E. (2016) Said that Problem-solving is the process of eliminating actual situations and desires. Meanwhile, problem-solving is a method that has the potential to produce effective and meaningful teaching and learning because it is a strategy that is applied based on experience and is student-centred. According to Yasin, R.M., Halim, L., & Ishar, A. (2012). Problem-solving is a major part of everyday experience and is found everywhere Jonassen, D.H. (2011). added

that problem-solving is a mental process that requires a person to think critically and creatively to look for alternative ideas and specific steps to face each obstacle In'am, A. (2016).

Solving problems received by students can help them improve student achievement, increase their interest in a subject and change students' attitudes towards learning according to Yasin, R.M., Halim, L., & Ishar, A. (2012). Based on Prabha, S. (2015), Solving problems is an important part of teaching learning. The use of problem-solving in learning implies a change in the teacher's role from sharing information content to encouraging critical reflective thinking in students. If a problem is known to be an inappropriate understanding, then the goal is directed at the sequence of cognitive operations Jonassen, D.H. (2011)

From Culaste, I. C. (2011). Problem solving is an important component in mathematics education where it plays a practical role in individuals and society. Problem-solving is an abstract and complicated process that involves human thinking and reasoning; furthermore, this condition is an important learning facility for trying to create contextual problem-solving programs, where a pattern is needed to be able to solve problems. Based on In'am, A. (2016). The aim of learning by applying the approach is to improve students' analytical and problem-solving skills. Collins, J. W. & O'Brien, N. P. (2011)

According to Jonassen, D.H. (2011) In problem-solving, the key to problem-solving is how to solve problems that represent the problem space, that is how to solve representing problem frames for themselves. Solving a problem is when completing statements posed as problems that require skills or is called problem-solving. Of course, a wise problem solver will always turn around, choosing solutions that are efficient and effective in dealing with every problem Haylock, D. & Thangata, F. (2007). The steps for solving problems, according to Polya, George (1985), are (a) understanding the problem, (b) preparing a problem-solving plan, (c) implementing the problem-solving plan, and (d) checking again So that monitoring control in problem-solving will be the main determinant of success in problem-solving. In solving problems, of course, a solution will take time to achieve. It is necessary to review or evaluate ourselves regarding the process of solving the problems we are facing so that when solving problems, we can always be prepared. In solving the problems a person faces, they will not only solve the problems they have faced but also the problems they will face.

Therefore, a diagnostic assessment is needed to find out to what extent students understand mathematical concepts because diagnostic tests are a good measurement tool for assessing students' understanding of mathematical concepts, where most students do not really understand the concepts when given a test by Suwarto (2013).Diagnostic tests function to determine students' weaknesses so that the results can be used as a basis for providing follow-up in the form of appropriate treatment in accordance with the student's weaknesses (Suwarto, 2013). The purpose of diagnostic tests is to identify students who experience problems in learning (Nursalam, N., 2016).

Several diagnostic tools can be used, that is interviews, open questions, concept maps, and test instruments, that is in the form of a description test or two-level multiple choice. Of these four diagnostic tools, the two-level multiple choice test is very suitable for measuring students' level of understanding of concepts. This assessment is divided into several types, including formative assessment, diagnostic assessment, and summative assessment Mahendra, I. W. (2019). In education, there is something called a diagnostic assessment, which can be used to diagnose or provide an analysis of students' basic abilities, one of which is problem-solving ability and also to determine students' initial conditions. Diagnostic assessment is divided into two, that is non-cognitive assessment and cognitive assessment by Nasution, S. W. (2022). Diagnostic assessments generally have the aim of examining students' basic abilities and showing an initial picture of students Kemendikbud (2021). With this assessment, teachers are able to provide an overview of student's abilities. They are also able to arrange the stages of students' cognitive development so that students are able to obtain maximum knowledge. From Haryanti, S. (2018), using diagnostic tests, teachers are also able to adjust the actions to be taken or subsequent efforts in teaching and learning activities. With this assessment, teachers are able to provide an overview of student's abilities. They are also able to arrange the stages of students' cognitive development so that students are able to obtain maximum knowledge. There are differences in the objectives of cognitive and non-cognitive diagnostic assessments.

But in the realStates that assessment can collect information about student learning to provide instructional decisions that are tailored to whether the process is going well or not. Based on the objectives, there are four types of assessment, that is placement assessment, diagnostic assessment,

summative assessment and formative assessment. By Stiggins, R. & Chappuis, J.(2012). From Mardapi, D. (2012), one of the competency-based tests is using diagnostic assessment.One technique that can be used to detect student errors in solving mathematical problems is using diagnostic assessment. Diagnostics is basically the action of properly analyzing a problem and identifying its causes for the purpose of making decisions based on classification by Rupp, A.A., Templin, J., & Henson, R. A. (2010).

The difference between a diagnostic assessment and a formative assessment can be seen from its function and the time it is carried out. Diagnostic assessments are useful for revealing learning difficulties experienced by students based on errors made by students when carrying out assessments in certain subjects. In general, a diagnostic assessment is given after a formative assessment, that is, if the standards that have been set still need to be achieved. Questions in diagnostic assessments tend to have a low level of difficulty and cover material that students find difficult. Meanwhile, formative assessments are carried out periodically during the teaching and learning process. This assessment is useful for monitoring student learning progress, and the results provide feedback for teachers and students. The results of this assessment are information about the lesson objectives that have been achieved and those that have not been achieved.

Diagnostic assessment is defined as an assessment that is used to determine the weaknesses and strengths of students' abilities in solving mathematical problems Gurel, D.K., Eryilmaz, A., & McDermott, L.C. (2015). This is in line with the definition of diagnostic assessment, which states that diagnostic assessment is an assessment to detect student weaknesses or mistakes so that, based on the diagnostic results, appropriate treatment can be given by Kemendikbud (2021). The main function of diagnostic assessment is identifying errors experienced by students and planning follow-up actions in the form of efforts to deal with errors that occur.

Students' strengths and weaknesses in learning can be identified through diagnostic assessments. Diagnostic assessment is to find out again about the difficulties experienced by students through errors made by students when solving assessment questions that arise and develop. To find it cannot be done immediately, a complete and thorough analysis of capabilities is needed.

A diagnostic assessment can be said to be good if it can provide an accurate picture of the students' misconceptions based on information about the errors they make. Leighton, J. P., and Gierl, M. J. (2007) suggest that a diagnostic assessment that is called good is an assessment that can show whether someone has mastered a skill or not. The results of diagnostic assessments can provide information to teachers regarding students' initial abilities and misconceptions before starting learning activities.Diagnostics in education and diagnostics in the medical world have many similarities, but diagnostics is broader in the world of education. Diagnostics in the medical world are generally related to disease conditions or physical things that can be seen clearly, and the cause is specific. This is different from diagnostics in the world of education. The large number of mistakes made by students as evidence of learning difficulties is not caused by structural defects or physical defects, but these usually arise not only from one cause but from many factors that occur simultaneously.

But inthe real, based on field observations conducted by researchers at the research location, it was found that teachers had not yet made diagnostic assessments in accordance with the rules of the independent curriculum. The diagnostic assessments used were only about asking about motivation and interest in learning mathematics. There was no diagnostic assessment that truly measured the prerequisite abilities of students before learning began.

2. Method

Development Model

The research method used in this study is development research focused on the construction of diagnostic tests. Retnawati's development model (2016: 3-6) contains nine steps, that is (1) Determining the purpose of compiling the instrument, (2) Finding relevant theories or material coverage, (3) Compiling instrument item indicators/questions, (4) Compiling instrument items, (5) Validating content, (6) Revising based on validator input, (7) Conducting trials on appropriate respondents to obtain participant response data, (8) Conducting analysis (reliability, level of difficulty, and differentiating power), and (9) Assembling the instrument. After the product development stage is

complete, it will continue to the product stage. This product stage includes two things, that is conducting tests using the resulting product and then interpreting the test results.

Development Procedure

Based on Retnawati's development model (2016: 3-6), the product development stages in this study consist of nine steps,that is:

a. Determining the purpose of compiling the instrument.
   The purpose of compiling this instrument is to analyze the problem-solving abilities of junior high school students.
b. Finding relevant theories or material coverage.
   The instrument developed is a diagnostic test, then for the scope of the material used in this study is the Test that is compiled consisting of 10 questions with two questions from class 6 semester 2 material, three questions from class 7 semester 1 material, three questions from class 7 semester 2 material, and two questions from class 8 semester 1 material.
c. Compiling instrument item/question indicators.
   The question indicators that will be made are adjusted to the scope of the existing material, which includes circle and mean material, median mode, integer material, fractions, comparisons, flat shapes, data, and algebra
d. Compiling instrument items
e. Content validation.
   Content validation will later be carried out by experts. The experts selected by the researcher as validators are three UNSRI Lecturers.
f. Revision based on validator input.

Trial Subjects and Product implementation

The trial of this instrument will be tested in class IX at one of the junior high schools in Palembang who have studied the tested material. The results of the instrument trial will be used to determine the validity of the instrument, the reliability of the instrument, While for the product application stage, the product will be applied or given to class VIII students of junior high schools in Palembang. Sampling in this study used purposive sampling

Data Collection Techniques and Instruments

The data collection techniques used are tests, interviews, questionnaires, and documentation. While the data collection instruments used are instrument validation sheets, interview guide sheets, and documentation in the form of student responses or answers to the test.

The data analysis techniques used in this development research include:

a. Content Validity

To determine the validity of the content of an instrument, an instrument validation sheet can be used which is then submitted to the validators to be filled in and given input. The researcher asked the expert to check the accuracy between the suitability of the question items with their indicators and the editorial writing of the questions. If there are still errors in making the instrument, the instrument is revised again.After being examined by an expert, in this case as a validator, the expert then provides an assessment of the instrument. The assessment consists of five criteria

Table 1 ***Validity Criteria***

value	explanation
1	Not Relevant
2	Less Relevant
3	Sufficient
4	Relevant
5	Very Relevant

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Value Description After being assessed by experts, the researcher then calculates the assessment results using a validity index, including the index proposed by Aiken (1980: 956) as follows:

$$V = \frac{\sum_{i=1}^{n} s_i}{n(c-1)} \text{ where } s_i = r_i - l_0$$

explanation:

r_i : the rating of the assessor of the ith question item
l_0 : the lowest score in the scoring category
c : the number of categories that the rater can choose
n : the number of respondents

The range of V numbers that may be obtained is between 0 and 1. The higher the V number or the closer it is to 1, the higher the validity of an item/question item, and if the V number is close to 0, the higher the validity of an item/question item. questions are also getting lower.

b. Instrument Reliability

The data analysis technique for estimating the reliability of this instrument uses the internal consistency estimation technique with the Cronbach's Alpha formula. The internal consistency estimation technique with the Cronbach's Alpha formula assisted by the IBM SPSS 20 application. If the Cronbach's Alpha value is in the range of 0.60 to 1, the instrument has a high correlation or is reliable. Meanwhile, if the Cronbach's Alpha value is less than 0.50, the instrument has a low correlation or is not reliable (Basuki & Hariyanto, 2014: 105).

The important thing when conducting a test is to see the test's ability to capture information from test participants. When the test has a high level of difficulty above the student's ability level, then the student will find it difficult to answer the test questions given. Therefore, teachers should really understand the student's abilities and evaluate the test that has been given to test participants by analyzing the difficulty index of the questions. The difficulty index for the test items used in this study can be calculated using the following formula:

$$p = \frac{the\ number\ of\ students\ who\ answered\ correcly}{the\ number\ of\ students\ who\ took\ the\ test}$$

The range of possible scores is obtained by calculating the difference between the maximum possible score and the minimum possible score. For example, a test item is scored on a scale of 1-5, then the range of possible scores = 5-1 = 4. If p is 0 (too difficult) or 1 (too easy) then the item should not be used, because it does not provide clear information on the differences in student abilities. So based on Allen & Yen (1979: 121) the p value criteria are summarized in the following table 9.

Table 2 *Reliability Criteria*

Criteria	**categori**
$p < 0{,}3$	Difficult
$0{,}3 \leq p \leq 0{,}7$	Moderate
$p > 0{,}7$	Easy

Analysis of problem-solving abilities in terms of learning interest

The score for the interest in learning questionnaire is calculated based on the weight of the statements given. Next, the questionnaire results are grouped based on the level of interest in learning according to Table 3

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Table 3 ***Interest Criteria***

Criteria for interest	Category
$x \geq (\bar{x} + s)$	height
$(\bar{x} - s) < x < (\bar{x} + s)$	Medium
$x \leq (\bar{x} - s)$	Low

The following are the results of the analysis of students' interest in learning mathematics after administering the learning interest questionnaire.

3. Results and Discussion

Initial Product Development Results

The product developed in this study is a diagnostic test. The test developed aims to determine students' problem-solving abilities. The steps for product development in this study are:

a. Compiling Test Specifications

The initial step in compiling the test is to determine the purpose of the test. The purpose of the test is to determine students' problem-solving abilities. The next step is to compile the test grid. The test grid contains material, indicators, and question item numbers.

b. Writing Test Questions

Based on the grid that has been determined in the previous step, writing questions is done by adjusting the indicators on the grid that has been created.

c. Reviewing test questions

Question review or content validation is carried out by three experts who are UNSRI lecturers. The score for each test item on the validation sheet is between 1 and 5. Meanwhile, qualitative question review is in the form of a summary of opinions from each expert to improve the question items. In addition to the test instrument, the interview guideline instrument is also validated in the same way. The score for each question in the interview guideline is between 1 and 4. For the assessment of each question item, a validation sheet is given to each expert. The results of filling in the expert validation sheet are then analyzed using the Aiken formula which will produce a validity index (V).

The range of V numbers that can be obtained is between 0 and 1. The higher the V number or the closer to the value of 1, the higher the validity of an item/question item, and if the V number is close to 0, the lower the validity of an item/question item. The following are the results of the calculation of the validity index (V). Based on the validation results of the diagnostic test instrument as in table 11, it was obtained that each validator gave an assessment with a final result of its validity index of more than 0.8, which means that its validity is high. So in general it can be concluded that the diagnostic test instrument is valid, which means that the diagnostic test instrument has met each question indicator and is valid for use in analyzing students' problem-solving abilities. The non-test instrument in the form of an interview guideline was also validated by experts. Based on the validation results, it was obtained that the interview guideline instrument was given an assessment with a valid category. The results of the validation of the guidelines and interview instruments for each criterion have been met. This shows that the guidelines and interview instruments are valid for use.

d. Conducting a Trial Test

The instrument trial was conducted at SMP 40 Palembang. The trial subjects were class IX-3 consisting of 36 students.

Product Trial Results

The instrument trial was conducted at SMP 40 Palembang. The trial subjects were class IX-3 consisting of 36 students. Based on the results of the product trial, the data obtained will be used to analyze the characteristics of the instrument in the form of construct validity, reliability, and difficulty index. Reliability refers to the consistency of test scores or other measurement results from one measurement to another. In other words, a test is said to be reliable if the measurement results are close to the actual state of students or are able to distinguish between smart and poor students. According to Ebel and Frisbie (1991: 86) the reliability of the instrument is met if the Cronbach's alpha value ≥ 0.65. The results of the reliability estimation for the two-tier diagnostic test instrument using SPSS obtained a Cronbach's alpha value of 0.760, which is greater than 0.65. Based on this, it can be concluded that the two-tier diagnostic test instrument that was prepared was reliable. The results of the reliability estimation using SPSS can be seen in the following table:

Table 4. Results of Instrument Reliability Estimation

Cronbach'sAlpha	N ofItems
.760	36

Product Revision

The test instrument that has been developed is then checked by a validator who is in accordance with the field of Mathematics. The validator who checked the diagnostic test instrument in this study involved three experts. The advice from the validator was carried out by correcting essay question, that is by arranging the answer choices based on the order of the largest and smallest numbers.

Field Tests

The validated and revised prototype (prototype 2) was tested on research trial subjects, that is 33 students in class VIII-4 at SMPN 40 Palembang.

Students were asked to take a mathematical problem-solving ability test, which contained 10 descriptive questions. At the beginning of the test activity, researchers distributed questions and answer sheets to students.

Analysis of student questionnaires

The results of the analysis of the questionnaire responses to the diagnostic assessment instrument in the one-to-one test showed that the average positive response of students was 75.8%. The average negative response of students was 24.2%, while in the small group trial, the average positive response of students was 79.6%. The average negative student response was 20.4% so the student response questionnaire met the "achieved" criteria, and no improvements/revisions to the test instrument would be developed because more than 50% of students gave positive responses.

Diagnostic Assessment Reliability Test

Based on the reliability test results on the SPSS program, the reliability value of the two-level multiple-choice diagnostic test instrument is 0.76, with a very high interpretation. This shows that the instrument is reliable.

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Analysis of problem-solving abilities in terms of learning interest

The score for the interest in learning questionnaire is calculated based on the weight of the statements given. Next, the questionnaire results are grouped based on the level of interest in learning according to Table 1

Table 5 *Interest Criteria*

Criteria for interest	Category
$x \geq (\bar{x} + s)$	height
$(\bar{x} - s) < x < (\bar{x} + s)$	Medium
$x \leq (\bar{x} - s)$	Low

The following are the results of the analysis of students' interest in learning mathematics after administering the learning interest questionnaire.

Table 6 *Interest Category*

Category of Interest	Student
height	9
Medium	19
Low	5
Amount	**33**

The results of the learning interest questionnaire showed that the dominant interest in learning was in the medium category, that is 19 people. After completing the questionnaire, students are asked to work on diagnostic assessment questions. The questions given are 10 essay questions. The following are diagnostic assessment questions.

SOAL TES DIAGNOSTIK

Satuan Pendidikan : SMPN 46 Palembang

Mata Pelajaran : Matematika

Kelas/Semester : VIII/Ganjil

Alokasi Waktu: 80 menit

1. Sebuah stadion berbentuk lingkaran dengan diameter 105 meter. Di sekeliling tepi stadion akan dipasang lampu sorot dengan jarak antar tiap lampu sama panjang. Jika jarak lampu adalah 5 meter, tentukan banyak lampu sorot yang diperlukan untuk dipasang di sekeliling stadion.
2. Data terbesar dari ukuran sepatu 17 siswa kelas 6 adalah 37 dengan selisih nilai terbesar dan terkecil 5. Jika median dari data tersebut adalah 38. Tentukan rata-rata terbesar dari data tersebut.
3. Bu lisa membuat minuman degan mencampurkan sirup $1\frac{3}{4}$ liter, air mineral $25\frac{1}{2}$ liter, dan air soda $2\frac{1}{4}$. Campurkan bahan tersebut kemudian dimasukkan ke dalam botol dengan volume 0, 5 liter. Tentukan banyak botol yang diperlukan.
4. Tentukan banyaknya bilangan bulat dari 1 sampai dengan 200 yang merupakan kelipatan 3 tetapi bukan kelipatan 4.
5. Proyek perbaikan jalan harus selesai selama 30 hari dengan pekerja sebanyak 15 orang. Setelah 6 hari pelaksanaan, proyek tersebut dihentikan selama 4 hari karena suatu hal. Jika kemampuan bekerja tiap orang sama dan agar proyek dapat selesai tepat waktu, tentukan pekerja tambahan yang diperlukan.
6. Sebuah meja dengan permukaan berbentuk lingkaran hendak ditutup taplak berbentuk lingkaran pula. Panjang jari-jari taplak 7 cm lebihnya dari jari-jari meja dengan keliling lingkaran pada permukaan meja adalah 176 cm dan harga setiap 1 m^2 kain taplak adalah Rp 30.000, 00. Tentukan harga taplak meja.

Figure 2 The DiagnosticTest

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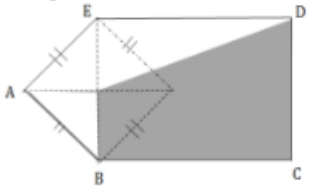
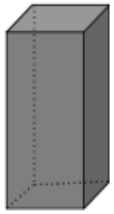
7. Perhatikan gambar di bawah ini!



Diketahui panjang $BE = 6\ cm$, $BC = 10\ cm$, dan $CD = 8\ cm$. Tentukan luas daerah yang diarsir.

8. Diketahui terdapat sebuah data berat badan 9 siswa kelas VII. Data tersebut menunjukkan bahwa data terbesar adalah 54 dengan rata-rata terbesar yang mungkin dari data tersebut adalah 44. Tentukan nilai median yang mungkin dari data tersebut.
9. Jika diketahui nilai $2x + 3y = 7$ dan nilai $y = 1$, maka tentukan nilai $x + y$.
10. Perhatikan gambar di bawah ini!



Tentukan ukuran luas prisma tegak tersebut.

Figure 3 The DiagnosticTest

The results of the diagnostic test data to identify students' problem-solving abilities in terms of their interest in learning mathematics can be seen that the number of students in the high interest in learning category who meet the Understanding Problem indicator is 60% of the percentage of students who fulfil the Devising a Plan indicator is 50%, The percentage of students who fulfil the Carrying Out the Plan indicator is 50% and only 30% of students fulfil the Looking Back indicator. Students with a medium interest in the learning category, the Understanding Problem indicator of 40%, the percentage of students who fulfil the Devising Students a Plan indicator is 20%, the percentage of students who fulfil the Carrying out the Plan indicator is 20%, and only 15 % of students fulfil it. Looking back, indicator. Moreover, in the low interest in learning category, which meets the Understanding Problem indicator of 25%, the percentage of students who fulfil the devising a Plan indicator is 10%, the percentage of students who fulfil the carrying out the plan indicator is 10%, and only 0% of students fulfil the looking back indicator. Based on the results of students' work in answering diagnostic tests, it can be said that this test instrument product is quite effective in identifying students' problem-solving abilities in terms of their interest in learning mathematics.

Discussion

The development of a two-level multiple-choice diagnostic test instrument to identify students' conceptual understanding has gone through a series of phases in the development of the Tessmer model, starting from the preliminary stage, self-evaluation, prototyping stage (expert review, one-to-one, small group), and field tests, which produce a product. The product in question is a 10-question diagnostic test instrument. Before the development process is carried out, a test instrument quality criterion has been established to see the extent of the success of the product produced.

Based on the results obtained, that is expert assessment and validation as well as field trials, the resulting test instrument achieved the predetermined criteria, that is valid and reliable. Based on the results of diagnostic test data, it is known that students' ability to understand concepts is quite good, as evidenced by the large percentage of test takers who understand the concept compared to those who have misconceptions and do not understand the concept. However some students need clarification and

need help understanding the concept of certain questions or material. The test results show that the diagnostic test developed is able to identify students' level of conceptual understanding, it can be seen from how many students are identified as having misconceptions, not understanding the concept or understanding the concept. Diagnostic tests must be able to provide an accurate picture of the student's difficulties based on information about the errors they make. Diagnostic tests are used to assess students' conceptual understanding of key concepts on certain topics, specifically for concepts that tend to be less well understood so from the results of this diagnostic test, it can be seen that in certain material, students experience the most misconceptions, much through analysis of the level of understanding of the concept.(Salsabila, Nadia Putri, dkk (2024))

The results of the analysis of students' conceptual understanding show that the question item with the highest percentage of misconceptions is question number 8, with a percentage of misconceptions of 40% or as many as 12 out of 30 test takers who experienced misconceptions on this question because, from the analysis of student's answers, it was difficult to differentiate between the operations of addition and matrix multiplication. In contrast, the material with the highest percentage of misconceptions is the geometric transformation material from question items number 16 to 19, that is 16%. This material is indeed quite difficult to apply the concepts; students often need help understanding how to interpret the concepts of rotation, relations, translation and reflection. The many misconceptions in this material prove that students need to understand the concepts being taught. Based on the results of observations and interviews, it was found that misconceptions about this concept originate from the learning methods applied by teachers and out-of-school reference books.

The speed at which students understand concepts also depends on the teacher's method and delivery when teaching in class. The right method and interesting delivery method make students understand the concepts being taught more quickly, and vice versa. Low student ability is also a factor in the occurrence of misconceptions among students. Due to limited abilities, students are less quick to understand concepts, giving rise to misconceptions or really not understanding the concepts. Mathematics subjects emphasize concepts.

Murizal (2012) and Nihayah (2021) states that in studying mathematics, students must understand mathematical concepts first in order to be able to solve problems and be able to apply this learning in the real world and be able to develop other abilities, which are the goals of learning mathematics. However, from the results of this research, in general, it can be said that, on average, students understand the concept of the material being tested, although some students experience misconceptions or really do not understand the concept.

Based on the analysis of the student answer sheets above, it can be seen that students with a high level of interest in learning have better problem-solving abilities than students with medium and low interest in learning. These results are in accordance with the opinion that interested students cannot fully apply all problem-solving indicators but can do so (Pratiwi Suchi, Sukmaningthias Novika, Sari Novita (2023); Hasanah, Yunisyah (2023)).

Based on the results of the interview, the selected research subjects, there are similarities, namely they are not used to working on math problems according to the procedures contained in problem-solving skills. Writing known and asked questions from the problem into the student's answer is something that is not common because teachers are used to giving students the freedom to solve math answers. Writing formulas or what is commonly called making plans in the work is also considered something that is not mandatory, especially for students in the middle and low categories (Maghfirah, 2023). It is the same as looking back at the answers that have been written to check whether the answer is correct or not. Students are used to ignoring this last stage because they feel that getting the final answer to the problem in the question is enough. This is in accordance with the research of Mentari, Nindiasari, and Pamungkas (2018) which states that the habit of teachers who only see the final result without seeing the process (Nofita & Kartini, 2022).

4. Conclusion

Based on the results of the diagnostic test data to identify students' problem-solving abilities in terms of their interest in learning mathematics, it can be seen that the number of students in the high interest in learning category who meet the Understanding Problem indicator is 60%, the percentage of

students who fulfil the Devising a Plan indicator is 50%, the percentage of students who fulfil the Carrying Out the Plan indicator is 50% and only 30% of students fulfil the Looking Back indicator. Students with a medium interest in the learning category, the Understanding Problem indicator of 40%, the percentage of students who fulfil the Devising Students a Plan indicator is 20%, the percentage of students who fulfil the Carrying out the Plan indicator is 20%, and only 15 % of students fulfil it. Looking back, indicator. Moreover, in the low interest in learning category, which meets the Understanding Problem indicator of 25%, the percentage of students who fulfil the devising a Plan indicator is 10%, and the percentage of students who fulfil the carrying out the plan indicator is 10%. Only 0% of students fulfil the looking back indicator. Based on the results of students' work in answering diagnostic tests, it can be said that this test instrument product is quite effective in identifying students' problem-solving abilities in terms of their interest in learning mathematics. Good quality is seen from validity and reliability. The test developed has a validity index of 1.00 and a reliability of 0.76 in the very high category. The student response questionnaire on the diagnostic assessment instrument in the one-to-one test showed that the average positive response of students was 75.8%. The average negative response of students was 24.2%, while in the small group trial, the average positive response of students was 79.6%. The average negative student response is 20.4%, so the student response questionnaire meets the "achieved" criteria, and no improvements/revisions to the test instrument will be developed because more than 50% of students gave positive responses. From the results of the student response questionnaire, it can be seen that this diagnostic test instrument product can be said to be practical to use, but to find out more about whether the test instrument that has been developed is good or not, it is recommended that future researchers be able to test it on a wider range of test subjects and The questions created must be adjusted to the time available.

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