DIAGNOSTIC TEST INSTRUMENTS FOR THE BASIS OF REMEDIAL LEARNING

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ABSTRACT

This research is a type of development research that is focused on developing a diagnostic test instrument to see students' conceptions. The research was conducted at SMA Negeri 1 Watampoen in class X. This research regulates the stage of developing an instrument consisting of 6 steps: (1) determining the specifications of the instrument, (2) determining the domain of the instrument, (3) determining whether the format is open-ended or closed ones to be used, (4) determining the test / instrument format, (5) determining whether the instrument is used for groups or individuals, (6) determining the length of the instrument. From this study, one third of the diagnostic tests were obtained which consisted of testing, examination format, and error checking. Giving remedials to students should not be done just like that without taking into account the knowledge that students have. By using a diagnostic test, students' understanding can be identified including what material they do not understand. This can be used as a reference for providing improvements to students

Keywords: Diagnostic Test, Fault Type Assessment, Remedial Learning

INTRODUCTION

Based on UU RI No. 20 Tahun 2003 tentang Sistem Pendidikan Nasional education is a conscious and planned effort to create an atmosphere of learning and the learning process so that students actively develop their potential to have spiritual, religious, self-control, personality, intelligence, noble character, and the necessary skills. himself, society, nation and state. The operationalization of national education has been described in Government Regulation Number 19 of 2005 concerning National Education Standards (SNP) which serves as the basis for planning, implementing and supervising education in the context of realizing quality national education.

In accordance with Permendikbud No 66 Tahun 2013 tentang Penilaian Pendidikan states that educational assessment as a process of collecting and processing information to measure the achievement of student learning outcomes includes: authentic assessment, self-assessment, portfolio-based assessment, tests, daily tests, midterm tests, final semester tests , competency level examinations, quality

level competency examinations, national examinations, and school/madrasah examinations.

In management theory, as a good learning planning system, the curriculum must include four things. First, the final educational outcomes that must be achieved by students (outputs), and formulated as graduate competencies. Second, the content of the material that must be taught to, and studied by students (input / standard content), in an effort to form the desired graduate competencies. Third, the implementation of learning (the process, including the learning methodology as part of the standard process), so that the three desired competencies are formed in students. Fourth, assessment of the suitability of the process and the achievement of learning objectives as early as possible to ensure that the inputs, processes and outputs are in accordance with the plan.

Effective learning is learning that can condition students to achieve maximum progress according to their abilities (Salamah, 2018). A good teacher always tries to create effective learning. The 2013 curriculum emphasizes the assessment of the three components in the process. The three components are skill, knowledge, and attitude (Khamim, 2019). The three components are found in the learning process. In addition, the 2013 curriculum emphasizes authentic assessment (actual assessment) (Rennert-Ariev, 2005; Sani, 2016). In a learning process, authentic assessment measures, monitors and assesses all aspects of learning outcomes (which are included in the cognitive, affective, and psychomotor domains), both those seen as the end result of a learning process, as well as changes and development of activities, and learning acquisition. during the learning process inside the classroom and outside the classroom (Morales & Fernández, 2019). The entire series of student learning becomes the point of attention of an educator in providing an assessment. Authentic assessment emphasizes both process and outcome. Thus, all students' views in the sequence of learning activities can be assessed objectively, as is, and not solely based on the final result (product) (Nurhayati, Jayusman, & Ahmad, 2018; Wildan, 2017). Assessment activities are not just asking or tapping knowledge that has been known in the learning process, but the actual performance of the knowledge that has been mastered.

Authentic assessment assesses students objectively asking students to demonstrate the skills and competencies they have (Ashford-Rowe, Herrington, & Brown, 2014; Hanifah & Irambona, 2019; Harianti, 2019; Swaffield, 2011). In fact, not all students can achieve maximum progress in the learning process. Students often face difficulties or problems and need help and support from the surrounding environment to solve these difficulties or problems. In order to help students appropriately, it is necessary to know in advance whether the difficulties or problems faced by these students are then analyzed and the solutions are formulated. For this purpose, a form of diagnostic test is required. Diagnostic tests are intended to determine student learning difficulties experienced by students based on the results of previous formative tests. Diagnostic tests can be used to identify the main problems that cause students not to achieve the learning outcomes specified as a reference in determining future remedial learning (Rusilowati, 2015; Srivastava et al., 2019). Thus, a diagnostic test is needed by teachers in determining future learning patterns.

Diagnostic means identifying a disease from the symptoms it causes. Like a doctor's work, before determining the right disease and medicine to cure it, a doctor will conduct a careful examination, for example: checking the pulse, breath sounds, knee reflex, eye pupil reflex, urine, blood, and so on. Such initial examination is called

diagnosing, while treating is called therapy. Likewise, a teacher to his students. Before being able to provide proper assistance, the teacher must administer a diagnostic test.

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┌──────────┐                      ┌──────────┐
│  Doctor  │                      │ Teacher  │
└──────────┘                      └──────────┘
     ↓                                 ↓
┌──────────┐      Analogy      ┌─────────────────┐
│ Diagnosis│                   │ Diagnostic Test │
└──────────┘                   └─────────────────┘
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│ Medicine │                   │ Remedial Learning│
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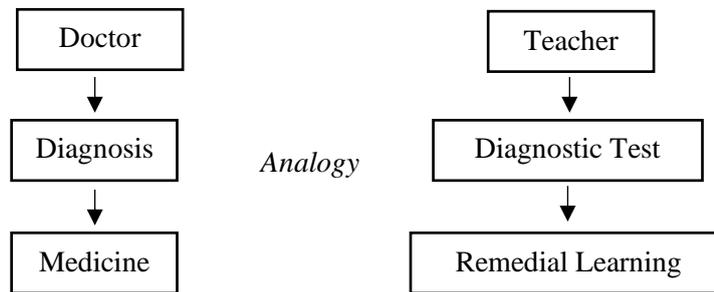
Figure 1.1 Diagnostic administration flow

Based on the chart above, it can be seen that a diagnostic test is a form of test that is used to find out the weaknesses of student misconceptions so that these results can be used as a basis for providing follow-up in the form of appropriate treatment and in accordance with the weaknesses of students. Therefore, we need a form of assessment tool that is able to assess not only the final results obtained by students but also able to detect where students experience difficulties or misconceptions.

METHOD

1. Types of research

This research is a type of development research that focuses on developing diagnostic test instruments to determine students' conceptions. The entire form of evaluation instruments developed meets valid, reliable, and objective criteria.

2. Research procedure

This study adopts the instrument development stage proposed (Shultz, Whitney, & Zickar, 2005) which consists of 6 steps: (1) determine the type specification of the instrument, (2) determine the domain of the instrument, (3) determine whether the open format -ended or closed-ended to be used, (4) determining the test / instrument format, (5) determining whether the instrument is used for groups or individuals, (6) determining the length of the instrument. These steps are then combined with the instrument development procedure for the preparation of a diagnostic test as follows:Pengembangan kisi-kisi

The grid is arranged in the form of a question specification table which contains the material to be tested, the competencies to be achieved and the proportions of each to be made. This grid can serve as a guide so that the assessment items to be developed can have the right proportions, so that in turn it can determine a person's success as well. The teaching material used is three dimensional, thus the arrangement of the grid and all its devices will focus on the material

3. Guidelines for assessing types of errors

Guidelines for assessing the types of errors were prepared after giving the initial test to students who had studied the material provided, namely three-dimensional geometry. From the students' answers are then grouped based on possible errors that can occur in the material. Among them are concept errors, data usage errors, algorithm errors, prerequisite errors, procedural errors, hierarchical errors, simplification errors, abstraction errors, principle errors, and visualization errors.

4. Diagnostic problems

The form of a diagnostic test is made in the form of a written test using item questions where the questions and answers given to students are in written form. The questions given are in the form of essay questions. The scoring rubric was also created as a teacher guide in the assessment process of student work. Diagnostic questions are made based on the types of errors that have been made previously which are thought to be able to reveal / detect whether the students who will be given the test understand or do not understand the three-dimensional geometry material.

5. Guidelines for assessment

The instrument of research guidelines was developed to see the extent to which students' ability to solve questions and to detect where students experienced errors.

The results of the preparation of this instrument will be obtained such as diagnostic test questions and assessment guidelines to determine student misconceptions.

RESULTS AND DISCUSSION

Initial Investigation Stage

Before the development of the instrument was carried out, an investigation was first carried out to examine what material was in accordance with this research and in accordance with the cognitive development of students and then arranged the selected material hierarchically. The material used in this research is geometry material with the subject of the concept of distance and angle in building space. Considering that the provision of this diagnostic test is carried out after a lesson material has been carried out, therefore the selection of this material is intended to be in accordance with the purpose of the diagnostic test itself.

Based on the results of interviews and preliminary observations made by researchers as stated in the background, it was found that all this time teachers, especially in the field of mathematics study, used final assessment which was only result oriented. The reference for remedial giving by the teacher is only based on the test of student learning outcomes as a whole. For students who do not fulfill the KKM, they must be given a remedial together with other students with the same question form. This is considered less effective. Remedials are only given to students for material / parts that are deemed insufficient. There is no need to do a repetition process that covers all the material in its entirety. Therefore, giving a test that is able to detect students' errors is deemed necessary to streamline the learning process in the future steps

Preparation of Tests

At this stage the design of the diagnostic test instrument includes:

1. Error Type Assessment Sheet

The error type assessment sheet is made based on the types of errors that can appear which are grouped into sections based on the characteristics of the existing errors. This assessment sheet includes common types of errors and a description of the types of errors. This type of error assessment sheet is made based on the results of the initial work of students who have studied three-dimensional geometry material. The results of the assessment of the instrument feasibility sheet for the diagnostic test development of a diagnostic test based on the learning outcomes provided by the validator are presented in Table 1 below.

Table 1 Results of the Agreement between Two Experts in the Specifications Table for the Development of a Diagnostic Test Instrument

		Validator I	
		Irrelevant Score (1 - 2)	**Relevant Score (3 - 4)**
Validator II	**Irrelevant Score (1 - 2)**	0	0
	Relevant Score (3 - 4)	0	24

From the assessment given by the two validators above, the validity level can be calculated based on the Gregory content validity formula as follows:

$$\text{Validitas Isi} = \frac{D}{A + B + C + D} = \frac{24}{24} = 1$$

So it can be concluded that the validity obtained is 1 or V = 100%. This means that the results of the assessment of the two validators have "strong relevance" with a content validity coefficient of more than 75% or V> 75%, so it can be said that the results of the measurement or the interference taken are valid.

This type of error sheet can later be a reference for teachers in detecting mistakes made by their students, such as based on the instruments that have been developed in the following table in three-dimensional material

No.	Type of Error	Code	Description of the Forms of the Errors Made
1	Concept Error	A	1. Incorrect placement of points in and out of space 2. Incorrect theorem / formula 3. Incorrect use of formulas that are not in accordance with the prerequisite conditions for the application of the formula 4. Wrong in placing a corner in space
2	Data Usage Errors	B	1. Does not use data that should be used 2. Incorrectly entering data into variables 3. Add unnecessary data
3	Algorithm Error	C	1. Wrong in the calculation process 2. Wrong in doing algebraic manipulation
4	Prerequisite Error	D	1. The prerequisite material has not been mastered (Pythagoras, the rule of sin and the rule of cos in a triangle)
5	Procedure Error	E	1. Wrong calculation step 2. Students' ignorance of the steps that must be taken
6	Hierarchy Error	F	1. Wrong in designing finishing steps
7	Simplification Error	G.	1. Wrong in completing answers 2. Wrong in conceptualization

No.	Type of Error	Code	Description of the Forms of the Errors Made
8	Abstraction Error	H	1. Wrong in translating the questions into pictures 2. Wrong in transforming the image into other parts
9	Principle Mistakes	G.	1. Wrong in determining the distance that must be calculated about the distance from the point to the line 2. Wrong in determining the distance that must be calculated about the distance of two intersecting lines 3. Wrong in determining the angle between two planes
10	Visualization Error	I	1. Wrong in distinguishing lines that intersect with those that cross 2. Incorrect in distinguishing lines that cross and intersect 3. Wrong in determining parallel lines on the plane 4. Wrong in determining the line that penetrates / cuts in the plane

2. Diagnostic Test Sheet

For the late diagnostic test, the device is developed following the indicators that have been made with every possible question that can arise for a basic competency. For example, the following Diagnostic Test instrument is intended to find out possible student errors which will later be used as material for remedials. The results of the assessment of the diagnostic test development questions based on the learning outcomes provided by the validator are presented in Table 2 below.

Table 2 Results of the Assessment / Validation of Diagnostic Questions for the Development of Diagnostic Tests on Three-Dimensional Geometry Material.

		Validator I	
		Irrelevant Score (1 - 2)	Relevant Score (3 - 4)
Validator II	Irrelevant Score (1 - 2)	0	0
	Relevant Score (3 - 4)	0	28

From the assessment given by the two validators above, the validity level can be calculated based on the Gregory content validity formula as follows:

$$\text{Validitas Isi} = \frac{D}{A + B + C + D} = \frac{28}{28} = 1$$

So it can be concluded that the validity obtained is 1 or V = 100%. This means that the results of the assessment of the two validators have "strong relevance" with a content validity coefficient of more than 75% or V> 75%, so it can be said that the results of the measurement or the interference taken are valid.
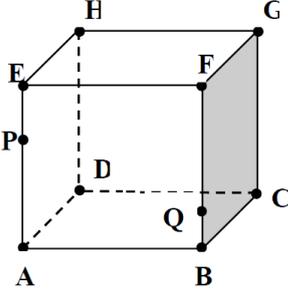
Consider the following ABCD EFGH square image:
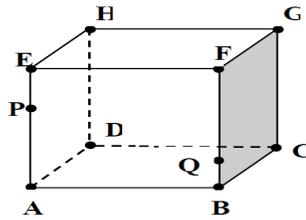
Determine the position between:
a. Point A about line AB
   Answer: ……………………………………………………………………… ..
b. Point E to the FG line
   Answer: ……………………………………………………………………… ..
c. Point C against the BCHE plane
   Answer: ……………………………………………………………………… ..
d. Point F with respect to the ABCD plane
   Answer: ……………………………………………………………………… ..
e. BE line with PQ line
   Answer: ……………………………………………………………………… ..

f. BC line with DH line
   Answer: ……………………………………………………………………… ..
g. FH line with the CHF field
   Answer: ……………………………………………………………………… ..
h. AB line with the CDHG plane
   Answer: ……………………………………………………………………… ..
i. AG line with BDHF plane
   Answer: ……………………………………………………………………… ..
j. ABGH field with PQGH field
   Answer: ……………………………………………………………………… ..
k. BCGF field with ADHE field
   Answer: ……………………………………………………………………… ..

3. Diagnostic Test Assessment Format
For the diagnostic assessment format is made in such a way that in addition to providing the final value obtained by students, it can also provide an overview of what errors the students get.

Answer	Type of Error If the Answer Does Not Fit
Consider the following ABCD.EFGH cube image: Determine the relationship or position between: a. Point A about line AB Answer: Point A on line AB or point A inside line AB or line AB through point A.	A1
b. Point E to the FG line Answer: Point E outside the FG line	A1
c. Point C against the BCHE plane Answer: Point C in the BCHE field	A1
d. Point F with respect to the ABCD plane Answer: Point F outside the ABCD plane	A1
e. BE line with PQ line Answer: The BE line intersects the PQ line	I1
f. BC line with DH line Answer: The BC line crosses the DH line	I1
g. Line AB to line EF Answer: Line AB is parallel to line EF	I3
h. FH line with the CHF field Answer: The FH line is located in the CHF plane	I4
i. AB line with the CDHG plane Answer: Line AB is parallel to the CDHG plane	I4
j. AG line with BDHF plane Answer: The AG line crosses the BDHF plane	I5
k. ABGH field with PQGH field Answer: The ABGH plane intersects the PQGH plane on the line GH.	I1
l. BCGF field with ADHE field Answer: The BCGF plane is parallel to the ADHE plane.	I4

In the grid table designed for the subject of geometry contains the types of assessment, the material given to students and the number of items used to see the types of errors that occur to students while working on the diagnostic questions they

make. The assessment sheet developed by the researcher also helps teachers in the assessment process of their students.

Giving Diagnostic Tests

Diagnostic tests have the following characteristics: (a) are designed to detect student learning difficulties, therefore the form and responses that are screened must be designed to have a diagnostic function, (b) are developed based on an analysis of the sources of errors or difficulties that may be the cause of the problem (disease) students, (c) use questions in the form of supply response (in the form of descriptions or short answers), so that they are able to capture complete information. If there are certain reasons for using the selected response form (for example the multiple-choice form), an explanation must be included for why choosing a particular answer so that it can minimize guessing answers, and can determine the type of error or problem, and (d) accompanied by a follow-up design (treatment) in accordance with difficulty (disease) identified. In completing a basic competency, the teacher is faced with several questions, first: Which student learning tasks have been satisfactorily achieved and which ones still need help ?; second: Which students have problems in learning and need help? To monitor student learning progress, the teacher provides a formative test. This test is designed to measure completeness of learning or completeness of minimum competence (KKM). If from the results of the formative test it is known that there are students who have not yet completed it, the teacher will conduct a test to diagnose possible sources of the problem.

Providing diagnostic tests can be done at the end of each meeting. From several diagnostic questions that have been developed, it can be selected according to the teaching material that has been given. Questions do not have to be given all at once after all teaching material has been given to students. It may be that the diagnostic questions are given at the end of one basic competency or even each indicator. From these results the teacher then compiles remedial lessons. Mastery of the material is very necessary for students as an initial capital to go to the next material because basically new material is difficult to teach when the previous material has not been understood by students. The following is a picture of the flow of giving the diagnostic test that can be done by the teacher.
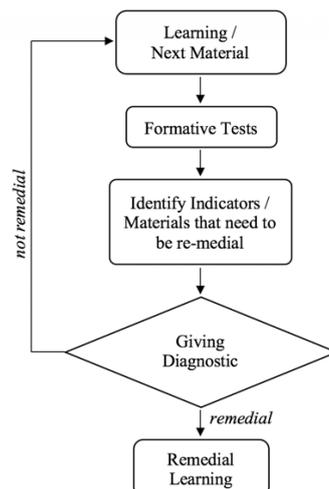

Figure 1. Diagnostic Test Flow

CONCLUSION

Giving remedials to students should not be done just like that without taking into account the knowledge that students have. By using the diagnostic system, students' understanding can be identified including what material they do not understand. This can be used as a reference for giving remedials to students. So that students do not need to repeat for all the material taught, it is enough that they do not understand material. Besides saving time, it can also streamline student learning time. All diagnostic test instruments developed have met the valid, reliable and objective criteria.

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