

Diagnostic of Students' Difficulties in Solving Mathematics Problems of National Examination Year 2015/2016

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Abstract. *This research aims at ascertaining kinds of students' difficulties and factors causing students' difficulties in solving mathematics problems of national examination towards students grade IX MTs Darul Huda Year 2015/2016. This research is a qualitative descriptive research. The research subjects were 6 students grade IX of MTs Darul Huda Sugihwaras having difficulties in solving problems in mathematics. The technique of collecting samples in this research was conducted by purposive sampling technique. The subjects were chosen based on data provided by a mathematics teacher of grade IX and tryout result. The methods of collecting data which were applied were essay test, interview, documentation, and questionnaire. The data analysis was conducted by quantitative and qualitative analysis. The result shows that, (1) kinds of difficulties encountered by students are (a) Difficulty in understanding problems is 20%, with an indicator that students misunderstand the problems. The cause is the low basic concept of mastery; (b) Difficulty in applying formula is 36.67%, with an indicator that students make mistakes in applying formula. The cause is students do not recognize formula which must be applied in solving problems, students do not know formula which must be used. (c) Difficulty in solving problems is 30%, with an indicator that students make mistakes when solving problems. The cause is students do not know steps in solving problems. (d) Difficulty in drawing conclusion is 15%, with an indicator that students make mistakes due to carelessness in solving problems. The cause is students are slipshod in understanding problems and in remembering formula. The factor causing students' difficulties is the low students' interest towards mathematics since media/props provided by teachers are not applied optimally yet.*

Keywords: *Diagnostic, Students' difficulties, National Examination*

Introduction

National Examination or commonly abbreviated as UN is government policy or effort in increasing and developing the education quality in Indonesia in order to create excellent generation of any fields. Many efforts done by government in improving the quality of education in Indonesia are not directly proportional towards the desired results. According to The National Agency for Educational Standards (BSNP), it indicates that UN results of SMP (Junior High School)/MTs level show reduction although its integrity value or honesty level increases. According to data provided by

Ministry of Education and Culture, in year 2015, the average score of SMP students was 62.18%, whereas in year 2016, the average score of SMP UN was 58.57% or decreased 3.6 points from last year. The score of Mathematics subject underwent the biggest decrease of SMP/MT's level National Examination (UN) in 2016. The changes ranged from 56.28 in 2015 to 50.24 in 2016.

The difficulties of learning mathematics undergone by students were shown through the low result of learning. When compared to subjects of Indonesian language, English language, and Natural Science, Mathematics showed the lowest average of national examination (UN) according to BSNP. Abdurrahman (2009: 231) states that the low learning result of mathematics is possible due to several common mistakes done by students having difficulties in learning mathematics such as understanding symbol, place value, calculation, misuses of process, and unreadable writing.

The students having difficulties in learning mathematics could be ascertained by recognizing students' mistakes when solving mathematics problems. The students finding difficulties in learning tended to have mistakes when given problems. According to Soedjadi (in Fadjar Hidayati, 2010: 4) states that the difficulties which are found by students will make it possible for students to do mistakes when answering test items. Thus, in order to ascertain kinds of students' difficulties in solving mathematics problems in the test, it can be seen and examined from the mistakes done by students when completing the test items.

The low result of national examination of mathematics was also obtained by students of grade IX MTs Darul Huda Sugihwaras. Based on the data obtained by the researcher when conducting observation on April 2nd, 2016, the average mathematics UN score was the lowest, 33.0. From the data mentioned previously, it can be stated that students of MTs Darul Huda Sugihwaras also find difficulties in learning mathematics, in particular when doing mathematics questions items of national examination. In order to increase the result of national examination, diagnostic of difficulties in learning mathematics need to be conducted. Thus, it will be ascertained kinds of difficulties found by students when doing mathematics questions items of national examination as well as factors causing those difficulties to occur.

The difficulties of learning on students are able to be detected by looking at students' mistakes in doing the assignment as well as questions items of a test. Mistake is a deviation towards the correct answer of a question. This means that the difficulties of students can be detected through wrong answers in doing questions items. Wiyartimi et al (2010: 91) states that there are several kinds of mistakes done by students, namely: a) conceptual mistake, which refers to a mistake in interpreting and applying mathematics concepts; b) principle mistake referring to a mistake in interpreting and applying mathematics formula; c) operational mistake, which refers to a mistake in applying operation in mathematics; d) mistake due to carelessness, which refers to a mistake because of miscalculations

Muhibbin Syah (2012: 170) mentions factors causing the learning difficulties namely: 1) Internal factors, things or conditions occurring in students themselves including students' psychophysical distraction such as the low intellectual capacity of students, the unstable condition of attitudes and emotion, the distraction of senses of sight and hearing (eyes and ears); 2) External factors, things or conditions coming from the external side of students including situation and condition of surrounding which do

not support the students' learning activities such as: family, society, school, for example: bad condition and location of school buildings, teachers' condition and the low quality of learning equipment.

Research Methods

This research is a qualitative descriptive research (Sugiyono, 2013:78) which is a research by analysing qualitative data. Descriptive research by qualitative approach aims at describing kinds of students difficulties in doing mathematics questions items of national examination and factors causing the difficulties. The location of research is MTs Darul Huda Sugihwaras school year 2015/2016, which is addressed on Jalan Mujahidin No. 123 Sugihwaras, Kecamatan Sugihwaras, Kabupaten Bojonegoro. The subjects of this research were students year IX MTs Darul Huda Sugihwaras year 2015/2016. The technique of collecting sample in this research was done by purposive sampling technique, so that the data obtained from the informant matched the needs and objectives of this research. In this research, sampling was based on students having difficulties in learning mathematics. Based on the tryout result and confirmation of mathematics teachers towards students having difficulties in learning mathematics, 6 students were chosen as research subjects.

The methods of data collection used in this research include: 1) Test method which was used to identify kinds of students' difficulties in doing mathematics questions items of national examination. The test used was in form of essays, questions items used were questions of mathematics national examination years 2014 and 2015 changed in the form of essays for 10 questions; 2) Questionnaire used to find out the cause why students did mistakes in doing mathematics questions items of national examination. The interview used in this research was semi-structured interview so that the researcher was able to find the problems more openly, informant was asked for opinion, idea, and the researcher listened attentively and recorded what were submitted by informant; 4) Documentation were scores data obtained from teachers, tryout results, pictures during research, and the students' test result.

Data analysis in this research was done by applying qualitative descriptive data analysis and quantitative data analysis. The technique of qualitative descriptive data analysis applied the following steps: a) Data reduction is a form of analysis which sharpens, classifies, directs, disposes unnecessary data, and organises data insomuch, and therefore the final conclusion can be drawn and verified; b) Data presentation is a group of information arranged which give possibility in conclusion drawing and action taking. In this stage, the data in the form of students' work were arranged based on the arrangement of research object. From the result of data presentation as students' work and the result of interview, an analysis was conducted and a conclusion was drawn including findings data, and therefore it could answer problems of this research.

Besides the analysis of qualitative descriptive data, an analysis of quantitative data was also applied as the following:

a) Test Result Percentage

Test analysis result applied in this research used formula as follows:

Notes:

P : Percentage done by students

S : Unwritten or incorrect step

B : Correct Step

The result is compared to the criteria of difficulties (Suharsimi Arikunto, 2012: 246) on Table 2.1:

Table 2.1. Levels of Difficulties

Levels of Difficulties %	Criteria
80 - 100	very high
66 - 79	high
40 - 65	average
0 - 39	low

b) Percentage of difficulties levels for each factor

Questionnaire analysis was applied to find out the percentage of difficulties levels for each factor causing students' difficulties in doing mathematics questions items of national examination. In calculating data which were obtained from the research subject's questionnaire, Likert scale was used by applying table of frequency distribution related to the formula used:

Notes:

P : percentage

F : frequency

N : the number of individuals

The percentage number which were obtained will be processed by being interpreted as follow:

Table 2.2. The causing factors of students' difficulties

Percentage of the causing factors %	Qualification
81 - 100	very high
61 - 80	high
41 - 60	average
21 - 40	low
0 - 20	very low

From the qualification of factors causing students' learning difficulties mentioned above, and therefore it could be determined that factors causing students' learning difficulties in solving mathematics problems of national examination were factors with qualification of very high, high, average, low, and very low.

Criteria which were used in data checking or in data validity checking of this research was credibility criteria. Credibility is a criteria to complete that information data which are collected must have truth value, meaning that the result of qualitative research is credible towards readers and can be received by respondents providing information which are collected during research. In this research, the researcher in data validity checking only applied Triangulation method. Since this method is considered to be the most suitable in accordance with the conducted research by the researcher and this is the easiest method to be conducted when compared to other methods. As is the triangulation, it is verification from findings by using varieties of information source and method of data collection. Triangulation method view is intended to vary and to validate qualitative analysis.

Results and Discussion

The result of data analysis based on test and interview with students indicated that students year IX MTs Darul Huda Sugihwaras found difficulties in solving mathematics problems of national examination. Factors causing those difficulties were analysed using questionnaire data. The discussion is presented as follows:

From the result of test and interview, a conclusion is drawn about kinds of difficulties presented in the following table.

Table 4.1. Kinds of students' difficulties

Kinds of students' difficulties	Questions Items									
	1	2	3	4	5	6	7	8	9	10
I	√	√	√	√	√	√				
II	√		√	√	√	√	√	√		√
II		√		√	√	√	√			√
IV	√			√					√	√

Notes:

- I : Difficulties in understanding problems
- II : Difficulties in applying formula
- III : Difficulties in solution operations
- IV : Difficulties in drawing conclusion

After finding out kinds of students' difficulties in solving mathematics problems of national examination, calculation was done to determine percentage of each difficulty. The following is conclusion presented in table.

Table 4.2. Kinds of difficulties percentage

Kinds of difficulties	The number of subjects	Percentage
Understanding problems	12	20%
Applying formula	22	36.67%
Solution operations	18	30%
Drawing conclusion	9	15%

Kinds of students' difficulties in solving mathematics problems of national examination from the research result are mentioned as the following:

1. In term of difficulty in understanding problems, students are considered to have difficulties in understanding problems when they do mistakes in understanding problems. Students are considered to do mistakes in understanding problems when they are not able to determine what is known and what is asked of the problems or students are able to understand problems, but are not able yet to get information contained in the question, and therefore students are not able to solve the problems and to find the solution. The percentage of student's difficulty in understanding problems is 20%. The cause of students having difficulty in understanding problems was due to the low mastery of basic concept. As mentioned in point four, all students found difficulty in solving problems in algebra.
2. Difficulty in applying formula, students are considered to have difficulty in applying formula when they do mistakes in applying formula. Students are considered to do

mistakes in applying formula when students have understood problems but they are not able to identify what operation or method will be used or needed in solving the problems. Difficulty in applying formula is 36.67%. The cause why students do mistakes is they do not recognize formula which must be applied in solving problems, students do not know which formula must be used. This could be seen when students did questions items about solid geometry volume, solid geometry surface area, combined flat roving.

3. Difficulty in solution operation. Students are considered to have difficulty in solution operation when they do mistakes during questions solution operation. Students are considered to do mistakes during solution operation when they are able to transform questions but do not recognize procedure needed to do operation or method appropriately and accurately. Difficulty in solution operations is 30%. The cause of students' difficulty in solution operation was that students did not ascertain steps in doing questions items. As seen in the students' work when students did essay questions about system of two variables linear equations in the second question item.
4. Difficulty in drawing conclusion. Students are considered to have difficulty in drawing conclusion when they do mistakes because of their carelessness made when doing questions items. Students are considered to do mistakes in completing mathematics questions items since they forget the concept, formula or even operation which will be used in answering mathematics questions items. Percentage of difficulties in drawing conclusion is 15%. The cause of students' difficulty in drawing conclusion was because students were slipshod in understanding questions. They did not remember the formula. As seen in 9th and 10th questions items, essay questions about mean, and combined solid geometry surface area.

The mistakes done by students in solving mathematics problems of national examination indicates that students still have difficulty in doing questions items of national examination. The relation between mistakes and difficulties can be seen in the following statement 'if a student has difficulties then he will make mistakes' (Ministry of Education and Culture in Fajar Hidayati, 2010:89). Thus, it can be considered as true statement that students have difficulties in doing questions items of national examination.

Based on the questionnaire analysis done to find out factors causing students' difficulties in mathematics, it can be concluded that internal factors (in students) provide a big influence which is 56.25%. Meanwhile, external factors (from outside of students) influence students' difficulties as 57.78%. This indicates that factors from the outside have more influence towards students' difficulties in mathematics.

Interest is the most influential factor in students' difficulties when doing questions items of national examination. The low students' interest in mathematics learning is caused by lack of learning media/instruments used by teachers during mathematics learning. The lack of students' learning motivation and facilities from schools which is low has a big influence towards students' difficulties in solving mathematics problems of national examination.

In overcoming the problems, a special handling is needed, especially in the external factors. External factors, by using instruments by teachers having an average qualification, meaning that the instruments provided by teachers have not optimally played role yet and therefore it can cause students have difficulties in learning mathematics. Dalyono (in Fajar Hidayati 2010: 91) in his book mentions that teachers

method can cause learning difficulties such as teachers do not use instruments in teaching that possible all senses to function.

Conclusion

Based on the test result, interview, and questionnaire given by students, a conclusion can be drawn as follows:

1. Kinds of difficulties experienced by students of grade IX MTs Darul Huda Sugihwaras in solving mathematics problems of national examination are:
 - a) Difficulty in understanding problems, with an indicator that students misunderstand the problems. The percentage of difficulties in understanding problems is 20%. The cause is the low basic concept mastery.
 - b) Difficulty in applying formula with an indicator that students do mistakes in applying formula. Difficulty in applying formula is 36.67%. The cause is students do not recognize formula which must be applied in solving problems, students do not know formula which must be used.
 - c) Difficulty in solution operation, with an indicator that students make mistakes during questions completing operation. Difficulty in solution operations is 30%. The cause is students do not know steps in solving problems.
 - d) Difficulty in drawing conclusion, with an indicator that students make mistakes due to carelessness in solving problems. Percentage of difficulty in drawing conclusion is 15%. The cause is students are slipshod in understanding problems. They do not remember formula.
2. The factor causing students' difficulties in doing mathematics problems of national examination of students of grade IX MTs Darul Huda Sugihwaras is the low students' interest towards mathematics since media/props provided by teachers are not applied optimally yet.

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