Analysis of Difficulty Levels and Discriminating Power of Items Made by Junior High School Mathematics Teachers

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Abstract

This study aims to determine the quality of mathematics subject matter for class VIII SMP Negeri 12 Poleang Barat based on discriminatory power and level of difficulty. This research is categorized as descriptive research. Techniques used to collect data are interviews and documentation. The data analysis conducted in this study consisted of an analysis of the level of difficulty, and an analysis of discriminating power. Based on the results of research and discussion of item analysis which includes the level of difficulty and distinguishing power on the Final Even Semester Final Assessment Essay for Mathematics Subject Class VIII SMP Negeri 12 Poleang Barat for the 2020/2021 academic year. From the results obtained, it can be concluded that from a total of 5 essay questions in terms of the level of difficulty, it shows that the final assessment items for the even semester class VIII mathematics subjects have a level of difficulty which states that there are 2 items that are considered difficult (6%), questions that are difficult. including the medium category there are 2 questions (27%), and the questions that are included in the easy category have 1 question (43%). Meanwhile, in terms of discriminatory power, it states that as many as 2 questions (18%) have poor discriminatory power, 1 question (23%) has moderate discriminatory power, 1 question (54%) has very strong discriminating power.

I. Introduction

Education is a means to achieve success for everyone. A country can be said to be advanced if it pays attention to the nation's education. Education comes from the word "dikti", which means to maintain and form practice. Thus education is an effort that is made consciously and intentionally to change human behavior individually or in groups to mature humans through teaching and training efforts. According to Arifin (2013:1) in the world of education, one of the competencies that must be mastered by teachers is learning evaluation.

According to Astuti et al (2019) Education is an obligation of every human being that must be pursued to hold responsibilities and try to produce progress in knowledge and experience for the lives of every individual. Education is one of the efforts to improve the ability of human intelligence, thus he is able to improve the quality of his life (Saleh and Mujahiddin, 2020). Education is expected to be able to answer all the challenges of the times and be able to foster national generations, so that people become reliable and of high quality, with strong characteristics, clear identities and able to deal with current and future problems (Azhar, 2018).

Mathematics is one of the basic sciences that plays an important role both in the development of science and technology and in shaping the human personality. Apart from

being considered as the Queen of science, mathematics is always related to everyday life and mathematics is a science that supports other knowledge. The role of mathematics has penetrated into all aspects of human life. Mathematics as a tool has been widely applied to simplify, streamline, and streamline human work. Learning mathematics is very important in everyday life because everything that is done in life can not be separated from mathematics. However, for students, mathematics is something that is very difficult and is considered something scary, so many students do not like learning mathematics.

This competence is in line with the teacher's responsibility in learning, namely evaluating learning, including in carrying out assessments, learning outcomes, assessment instruments, teacher abilities, and evaluating learning. Teachers should be equipped with knowledge about learning evaluation so that teachers can evaluate student learning outcomes. Teachers must also evaluate whether students can master the knowledge that has been given during the learning process. The results obtained from the evaluation can be used as feedback for teachers in improving their teaching activities.

Item analysis is an assessment of test questions in order to obtain a set of questions that have adequate quality. Item analysis is an activity that the teacher must do to improve the quality of the questions that have been written. Analysis of the quality of the items is a step that must be taken to determine the degree of quality of a test, both the test as a whole and the items that are part of the test. Item analysis is an analysis carried out to identify questions that are good, not good, or bad.

This research is based on previous research, including research conducted by Suprananto (2012), suggesting the analysis that educators need to do is item analysis. Item analysis activities are important activities in the preparation of questions in order to obtain quality items. The purpose of item analysis activities. Aiken (2012), defines items as reviewing and examining each item in order to obtain quality questions before use, improving the quality of test items through revision or discarding ineffective questions, and knowing diagnostic information to students whether they have understood the material that has been taught. . Quality questions are questions that can provide precise information about students who have mastered the material and students who have not mastered the material.

The facts on the ground show that the analysis of items is still rarely done by educators. There are several reasons why educators do not conducting item analysis, among others: (1) educators feel burdened in the item analysis process so they do not do it, (2) educators believe that the quality of the test questions made is good so they do not conduct further studies. According to the head of the Bandar Lampung City Mathematics Teacher Conference, the questions used for the semester exams were made by teachers who are experts in their fields and were not made based on the analysis that had been done. The item analysis is carried out by the school or each teacher, because analyzing the items as a whole in Bandar Lampung requires a large amount of money and time.

Analysis of the questions, among others, aims to identify good and bad questions. With the analysis of the questions can be obtained information about the good and bad questions and instructions for making improvements Arikunto (2013). "According to the opinion (Susetyo, 2015: 184), which says that, the level of difficulty is how difficult it is for an item to be answered by test takers or respondents". Ineffective, as well as to find out diagnostic information to students whether or not they have understood the material that has been taught (Aiken in Kusaeri and Suprananto, 2012:163).

II. Research Method

This research is categorized as descriptive quantitative research. Descriptive quantitative research is research that is intended to describe existing phenomena, which are taking place now or in the past. This study describes a condition as it is, depicts ordinary conditions with individuals or groups, and uses numbers. The research was conducted at SMP Negeri 12 Poleang Barat.

Data collection was carried out from March to July 2021 after the implementation of the Final Semester Exams for the 2021/2022 academic year. Which is on Jln. Mokole bandu no. 141, rakadua, kec. West Poleang, kab. Bombana prov. Southeast Sulawesi. The subjects of this study were all students of class VIII in Mathematics at SMP Negeri 12 Poleang Barat which consisted of 3 classes and each class had 24 students. The data collection techniques in this study used documentation and interviews. Documentation is all information that is printed or written as evidence in research. The documentation in this study is in the form of student answer sheets, test answer keys, and end-of-semester assessment questions for class VIII Mathematics at SMP Negeri 12 Poleang Barat. Interviews are data collection techniques as preliminary study to get to the problems experienced. Interviews are used as a data collection technique starting with making a list of questions that will be used when requesting information from informants.

III. Results and Discussion

Used at the time of the exam, answer keys and answer sheets for all class VIII students. The number of questions analyzed were 5 essay questions. The data is processed using manual calculations with the help of the Excel program.

3.1 Results

Based on the results of the research that the researchers did in collecting research data, using interview and documentation techniques, it is possible to present an analysis of the items for the Final Assessment of Even Semester Mathematics Subject Class VIII SMP Negeri 12 Poleang Barat for the 2020/2021 academic year, as follows:

a. Difficulty Level

The quality of questions that are not easy or not difficult is a good question. So, this test affects whether students have the ability to answer the question.

Table 1. Item Difficulty Index criteria

Criteria	Difficulty Index
0.00-0.30	Hard
0.30-0.70	Currently
0.70-1.00	Easy

The results of the analysis carried out, the category of items that included difficult there were 2 questions (6%), questions that were included in the medium category there were 2 questions (26%), questions that were included in the easy category there were 1 question (43%), Distribution of Final Assessment items Even Semesters of Class VIII Mathematics at SMP Negeri 12 Poleang Barat based on the level of difficulty are as follows:

Table 2. Distribution of Even Semester Final Assessment Questions Based on Difficulty Level

No	Difficulty Level	Question Points	Number of Questions	Percentage
1.	Hard	2, 5	2 questions	6%
2.	Currently	4.3	2 questions	26%
3.	Easy	1	1 question	43%

It can be seen in the table above about the proportion of item difficulty levels, so the Final Semester Assessment essay for Mathematics subject for class VIII at SMP Negeri 12 Poleang Barat is not in accordance with the proportion of item difficulty levels set. Meanwhile, the proportion of item difficulty level can be said to be good if it meets the proportion for the difficult category of 25%, moderate 50%, and easy 25%.
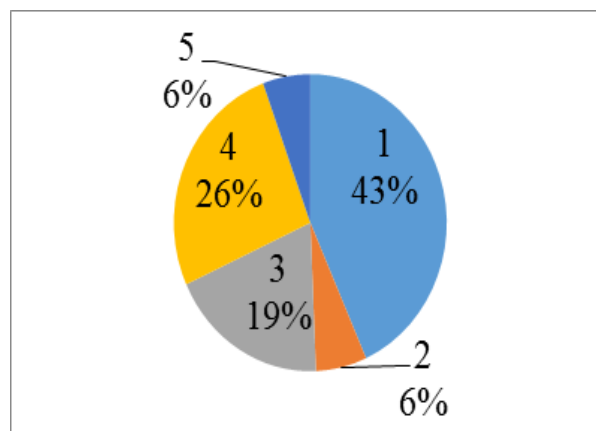

Figure 1. Diagram of the End of Even Semester Level of Difficulty

Based on the pie chart above, it shows that the difficult questions have 2 questions (6%), the current questions have 2 questions (26%), the easy questions have 1 question (43%). It can be concluded that the distribution of the item diagrams for the final even semester assessment of mathematics class VIII at SMP Negeri 12 Poleang Barat has a level of difficulty.

b. Distinguishing Power

Distinguishing power can be calculated by the discriminatory index number. The higher the index, the more capable the questions are to distinguish competent students from incompetent students. However, if there is a discriminatory power with a negative index, it means that many students do not understand the material compared to the group of students who understand the material. To measure the level of discriminating power with the following formula:

$$DP = \frac{SA - SB}{IA}$$

Arikunto (2013)

Information:
DP: Distinguishing Power
SA: Top Grade Score
SB: Total Lower Grade Score
IA: Total Top Group Ideal Score

Conditions:
If the number of students is more than 30, the division of upper and lower classes is 27% for each class.
If the number of students is less than or equal to 30, then the class division is 50% for each class.

Table 3. Criteria for Distinguishing Power Index

Item distinguishing power	Information
0,- 0.20	Weak
0.21 – 0.40	Currently
0.41 – 0.70	Well
0.71 – 1.00	Very strong
Signed Negative	Very ugly

Table 4. Results of Item Analysis of Distinguishing Power Questions

About	1	2	3	4	5
SA	106	13	61	108	18
SB	94	15	26	13	8
HE	108	108	108	108	108
DP	0.11	-0.02	0.32	0.88	0.09
Criteria	Weak	Very ugly	Currently	Very strong	Weak

Based on the results of the calculation of discriminating power from the Excel application, 1 (-1%) questions have very poor discriminating power, 2 questions (8%) have poor discriminatory power, 1 question (23%) has moderate discriminatory power, 1 question (62%)) has a very strong discriminatory power. The following is an explanation of the items based on distinguishing power.

Table 5. Distribution of Even Semester Final Assessment Questions for Class VIII Mathematics at SMP Negeri 12 Poleng Barat based on Distinguishing Power

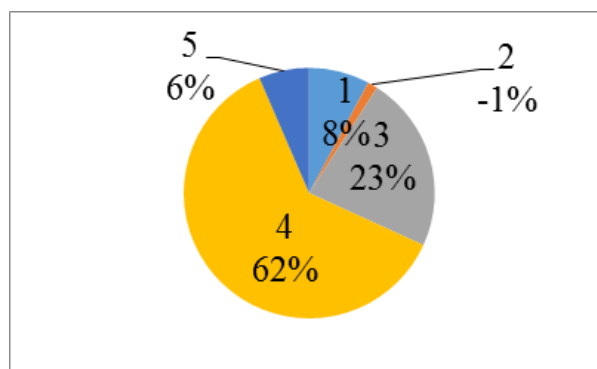| No	Distinguishing Power	Question Item Number	Total	Percentage
1	0.00-0.20 (weak)	1.5	2 questions	8%
2	0.21-0.40 (medium)	3	1 question	23%
3	0.71 – 1.00 (very good)	4	1 question	62%
4	Signed negative	2	1 question	-1%

Figure 2. *Distinguishing Power Even Semester Final Assessment Diagram*

3.2 Discussion

a. Level of Difficulty of Final Semester Assessment Questions for Mathematics Subject Class VIII SMP Negeri 12 Poleang Barat, Bombana Regency, Academic Year 2020/2021

There is a theoretical study presented by the researcher that the level of difficulty is an opportunity to correctly answer a test item at a certain level of ability of students. This is confirmed by the researcher's interview with Mrs. Novayanti.

"A good question is a question that is neither difficult nor difficult. But a very easy question can make students lazy to study because it is too easy. Likewise, if there are questions that are too difficult, students will quickly despair and have no enthusiasm to work on them again, because the questions are too difficult.

From the results of the analysis carried out on 5 essay questions for the Final Even Semester Mathematics Subject Class VIII SMP Negeri 12 Poleang Barat, Bombana Regency for the 2020/2021 academic year, it can be seen that the level of difficulty of the items is categorized into 4 categories, namely difficult, medium, easy and very easy. Based on table 5, it is known that there are 2 difficult questions, one of which is number 2.

The statement from question number 2 is as follows:

Given the angles at with and length Calculate the length and $\Delta PQRP < PQR = 30°PQ = 12$ cm. $PRQR$
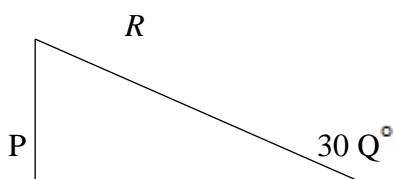
The questions above are considered difficult because of factors that come from students. Students lack understanding and lack of mastery of math subject matter. According to an interview from Mrs. Novayanti, S.Pd said that "The level of understanding of students varies. Some are quick to respond, some have to be re-taught before they understand. Most students find it difficult to understand. From the explanation of the interview results, it can be seen that students have difficulty working on the questions because their understanding power is lacking.

Then the example of item number 1 which has a very easy level of difficulty is as follows:

Question Number 1.

Which of the following numbers is a Pythagorean triple?
a. 7, 5 and 6
b. 8, 15 and 17
c. 10, 24 and 26
d. 10, 6, and 8
e. 24, 18 and 30

From the questions above, without students counting, they already know the answer, therefore many students can answer the question correctly. Overall, it can be said that of the 5 questions. The Final Assessment of Even Semester Mathematics Class VIII SMP Negeri 12 Poleang Barat for the 2020/2021 academic year when viewed from the level of difficulty, it is good enough because many items are in the medium category.   The results of this study are similar with Anas Sudijono (2012) who revealed that a good item is that the item is not too easy and not too difficult in other words the degree of difficulty of the item is moderate.

From the results of this study related to the level of difficulty, questions that have a very easy and very difficult level of difficulty must be discarded or revised again.

b. Distinguishing Power of Even Semester Final Assessment of Mathematics Subjects Class VIII SMP Negeri 12 Poleang Barat Bombana Regency 2020/2021 Academic Year

The use of differentiating power in the evaluation of learning is to show the extent to which each item is able to distinguish students who do not master the material and students who master the material. The results showed that the Final Even Semester Assessment Questions for Mathematics Subject Class VIII SMP Negeri 12 Poleang Barat Bombana Regency for the Academic Year 2020/2021 had 2 questions categorized as bad or 18% of the total number of questions, 1 item in the medium category or 23% of the total questions,1 questions categorized as very good or 43% of the total number of questions, 1 question categorized as very bad or -1% of the total number of questions.

These results are in accordance with the discussion of the theory which states that quality questions can be analyzed for distinguishing power, so that they can distinguish competencies in students. This is in accordance with the statement submitted by Mrs. Novayanti, S.Pd as a mathematics teacher. "The understanding of students in learning abilities is different. Therefore, with an evaluation test like this, differentiating power is used to find out how the child's abilities are and also to know which questions can distinguish the abilities of students and which are not.

From the results of the interview, it can be seen that the differentiating power of each item has a function, namely to distinguish between students who have understood the material and those who have not mastered the material. As for the questions that do not have distinguishing power, then the items have not been able to distinguish students who understand the material and those who do not understand the material. The question that has no distinguishing power is number 1.

Which of the following numbers is a Pythagorean triple?
a. 7, 5 and 6
b. 8, 15 and 17
c. 10, 24 and 26
d. 10, 6, and 8
e. 24, 18 and 30

The question has a very poor discriminatory power because the level of difficulty is easy so that it cannot distinguish which students from the upper group and lower group are. It is better if questions that have poor discriminating power are not used again in

future tests and are discarded because they do not have the ability to distinguish high-ability test takers from low-ability test takers.

Thus, the informant stated that discriminatory power was used as an evaluation of future assessment and learning. There are several items that have low discriminating power, therefore these items must be revised to make their distinguishing power even better. Items that do not have distinguishing power must be discarded and replaced with new items.

IV. Conclusion

Based on the results of research and discussion of item analysis which includes the level of difficulty and distinguishing power on the Final Even Semester Final Assessment Essay for Mathematics Subject Class VIII SMP Negeri 12 Poleang Barat for the 2020/2021 academic year. It can be concluded that from a total of 5 essay questions in terms of difficulty level, it shows that the final assessment items for the even semester math class VIII have a difficulty level which states that there are 2 items that are difficult (6%), questions that are included in the medium category. 2 questions (27%), and questions that are included in the easy category have 1 question (43%). Meanwhile, in terms of discriminatory power, it states that 1 question (-1%) has very poor discriminating power, 2 questions (18%) have poor discriminatory power, 1 question (23%) has moderate discriminatory power, 1 question (54%) has very strong discrimination.

As for suggestions from researchers, namely for questioning institutions that this research can be taken into consideration in improving ability and understanding in preparing questions and can improve the quality of items both in terms of level of difficulty and distinguishing power, teachers should improve learning strategies in accordance with understood learning objectives teachers, and to students, in order to practice harder so that the test results are as expected, because if you practice a lot it is difficult to achieve it well. Hard effort will determine the good or bad results that can be achieved later, therefore students must maximize their learning process to achieve the expected results.

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