Analysis of Mathematics Daily Examination Questions on the Topic of Statistics for Class VIII SMP

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**Abstract.** Education is one of the processes to improve the quality of human resources. Improving the quality of education is done by improving the quality of learning and the quality of the assessment system. Improving the quality of learning and the assessment system is carried out by evaluating the learning activities. One form of evaluation is a daily test. Daily test is a form of assessment of student learning outcomes which is carried out to see how far students understand the material. So that the questions used for daily tests are of high quality, item analysis is carried out. Item analysis is used to improve the quality of the questions that have been prepared by the teacher. The purpose of this study is to analyze the items so that the questions that have been prepared have good quality so that the objectives of the learning activities carried out can be achieved properly. The research method used in this research is descriptive qualitative to analyze multiple choice questions on statistical material for class VIII SMP. Data analysis conducted in this study consisted of analysis of questions based on Bloom's taxonomy, validity, reliability, effectiveness of distractors, analysis of difficulty level, and analysis of discriminating power. The results of the analysis carried out show that the daily questions made by the teacher have good quality and are suitable for use as an assessment of student understanding and achievement of learning objectives.

**Keywords**: Learning Quality, Daily Test, Item Analysis,

# introduction

These facts indicated that mobile learning can be used as an alternative for mathematics learning process especially because the ownership of phone greatly improved and become a common thing in life. There are many mobile application that can be implemented in learning process such as geogebra, quizizz, google classroom, and so on. It is hypothesized that the use of technology in the classroom can have a positive effect on the engagement of the student, and thus improving mathematics understanding and test scores. Therefore, the purpose of this study is to investigate some studies in educational research about 1) what application that can be used in learning mathematicss and 2) the impact of implementing technology especially mobile learning in the classroom and how these changes may affect the mathematics understanding.

Education is one of the processes to improve the quality of human resources in order to be able to compete in the era of globalization. Improving the quality of human resources is one of the goals of national education as contained in Law No. 20 of 2003 article 3 which states that national education functions to develop capabilities and shape the character and civilization of a dignified nation in the context of educating the nation's life, aiming to develop the potential of students to become Humans who believe and fear God Almighty, have noble character, are knowledgeable, capable, creative, independent, and become democratic and responsible citizens (Lazwardi, 2017) (Yusup et al., 2019). In addition, education is a process for the development of a person in the form of behavior in society and plays a role in creating a teaching and learning atmosphere so that students are more active in developing the potential that exists within themselves (Yenusi et al., 2019). One form of the educational process is teaching and learning activities carried out in schools.

Improving the quality of education in Indonesia continues to be improved through improving the quality of learning and the quality of the assessment system. The learning process and assessment are two things that are interrelated and cannot be separated because a good learning system will produce good quality learning. (Purwati et al., 2021). The learning process is carried out interactively, inspiring, fun, challenging, motivating, so that students can actively participate in learning activities (Ellya Novera, et al, 2021). Learning must be planned and structured properly so that the objectives of the learning process can be achieved properly and cause behavioral changes in students. One of the learning activities that have an effect on changing student behavior is learning mathematics. Mathematics learning is one of the lessons given at the primary and secondary education levels (Tama, 2017) (Syarifah et al., 2020). According to Rostika (2017) it is explained that mathematics is a universal science and is able to integrate with other subjects and real life (Yuliani, 2020). The purpose of learning mathematics is to prepare students to be able to apply mathematical concepts in dealing with various problems of everyday life. (Widodo & Purwaningsih, 2008) (Hardianti & Desmayanasari, 2019).

The purpose of learning mathematics can be achieved well, so there is a need for evaluation in learning activities. Learning evaluation is a tool to find out whether the learning objectives and the process of learning activities are running according to the specified goals (Elisa, 2015). Evaluation activities for students are used to determine the extent of their success in following the lessons given by the teacher (Sofiya, 2020). The tools used in the evaluation process can be in the form of tests or non-tests (Widodo & Purwaningsih, 2008). The test is defined as a method to measure a person's ability, knowledge and appearance (Budi Utomo, 2019). The test is a tool to measure student learning outcomes by providing a set of questions, statements, or a series of tasks that must be done or answered by students (Halik et al., 2019) (Hayati & Mardapi, 2014). This is reinforced by Mania et al., (2020) which explains that the test is a measurement tool in the field of education, the measurement/assessment can be in the form of a task either in the form of a question or an order that must be answered and completed by each student. The test aims to measure students' understanding of the material that has been taught and must meet the characteristics of a good test, namely validity and reliability. One form of the test is a daily test.

Daily tests are a form of assessment of student learning outcomes that are carried out to see how far students understand the material presented. Daily tests are a way to measure a person's ability about what material he masters (Anggraeni, 2016). Daily test assessments must be adjusted to the learning objectives and the learning process carried out (Fauziana et al., 2021). Students' errors in answering the questions given are influenced by several factors such as intelligence, maturity, teachers, parents, the environment or the question itself. The students' inaccuracy in answering questions and the lack of students' understanding of the material presented are also factors for student errors (Farida, 2015). In some studies, it is stated that the errors made by students on certain materials are conceptual errors and procedural errors in answering questions. Thus, it is necessary to analyze the items of mathematics questions to improve the quality of teaching and learning activities, achieve learning objectives, and improve students' mathematics learning outcomes.

# method

## Research Design

The research method used in this research is qualitative descriptive to analyze multiple choice questions on statistics material for class VIII SMP (Cohen et al., 2020). The sample of this study is the items of mathematics used for daily tests on statistical material, amounting to 20 multiple choice questions.

## Population and Sample

The subjects of this study were students of class VIII SMP Muhammadiyah Boarding School. The population in this study were all students of SMP MBS Klaten. As for the sample in this study, namely class VIII B MBS Klaten.

## Data Collection

The procedure in this study was carried out by collecting the syllabus, question grid, and daily test questions from the VIII grade teacher. Then adjust the questions compiled with the question grid and syllabus and adjust the daily test questions with the rules in studying the items. The instruments used in this study were interviews and analyzing daily test items based on cognitive level. From the data collected obtained from interviews and documents (items in the form of writing).

The data analysis consisted of problem analysis based on Bloom's taxonomy, validity, reliability, distractor effectiveness, difficulty level analysis, and discriminatory analysis. Each of these criteria can be calculated using the help of the Ms. Excel and SPSS.

# RESULTS

The results of the research conducted by interviewing Mathematics teachers at SMP MBS Klaten and analyzing daily math test items on statistics material. All eighth grade students opened 40 people because the SMP MBS Klaten school only consisted of two classes with 20 students in each class. The results of the item analysis carried out obtained the following results.

## Problem Analysis Based on Bloom's Taxonomy

In the cognitive domain of Bloom's Taxonomy, there are six levels of thinking processes, namely remembering (C1), understanding (C2), applying (C3), analyzing (C4), evaluating (C5), and creating (C6). The results of the analysis of questions based on Bloom's taxonomy on the daily test of statistics are obtained in the table below.

**Table 1.** Analysis of daily test questions based on Bloom's taxonomy

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Criteria** | **Taxonomy** | | | | |
| **C1** | **C2** | **C3** | **C4** | **C5** |
| Frecuency | 1 | 4 | 9 | 5 | 1 |
| Percentage | 5% | 20% | 45% | 25% | 5% |

## Reliability

Reliability is the consistency of a series of measurements or a series of measuring instruments. The main purpose of reliability is to show the consistency of the scores given to each other. The results of the reliability calculation are obtained in the table below.

**Table 2.** Results of reliability calculations using SPSS

|  |  |
| --- | --- |
| ***Cronbach’s Alpha*** | ***N of Items*** |
| **.722** | **20** |

## The Effectiveness of Deceptive Options

In the daily test questions, there are 20 questions with 4 choices of options, namely A, B, C, and D. These four options have their own frequency and effectiveness for each question. The following table shows the results of the analysis of the effectiveness of the Deceptive answer choice options as follows.

**Table 3.** Distribution of Frequency and Percentage of Effectiveness of Distractors Option in Daily Test of Statistics

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Number of item** | **Frecuency** | **Percentage** |
| Very Good | 2,4,5, 6,8,9,11,12,13,15,16,17,20 | 13 | 65% |
| Good | 1,3,7,10,18,19 | 6 | 30% |
| Bad | 14 | 1 | 5% |

## Difficulty Level Analysis

Analysis of the difficulty level of daily test questions on the topic of statistics obtained the following results.

**Table 4.** Grouping of the Difficulty Iems Index of Mathematics Daily Test

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Number of item** | **Frecuency** | **Percentage** |
| Difficult | 0 | 0 | 0% |
| Medium | 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20 | 20 | 100% |
| Easy | 0 | 0 | 0% |

## Different Power

The analysis of the differentiating power of the questions was carried out using the formula for the differential power index, the following results were obtained:

**Table 5**. Analysis of Differential Power Index on Statistics Topic.

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Number of item** | **Frecuency** | **Percentage** |
| Low | 16,19 | 2 | 10% |
| Medium | 6,8,9,11,13,14,18,20 | 8 | 40% |
| High | 1,23,4,5,7,10,12,15,17 | 10 | 50% |

# DISCUSSION

The results of the analysis table 1, it shows that the most questions made at the cognitive level of applying (C3) are 9 questions with a percentage of 45%. While the questions made with the least cognitive level are 1 question at the cognitive understanding level and at the cognitive understanding level (C1) and a question at the evaluating level (C5). The questions that are not made are at the cognitive-creating level (C6) due to the limited learning hours which are only 35 minutes in 1 hour of learning, the model questions are in the form of multiple choice and the questions are made according to school conditions and student characteristics.

The validity of the questions was carried out by the validator on 20 daily test questions made. The results of the validation carried out from the assessment of four validators obtained the following results:

1. Based on the coefficient values in the table for 4 raters and a level of 0.05 with 20 items, the coefficient value of v table aiken is 1.00, causing 16 valid items and 4 invalid items. For items that are not valid, revisions are made according to the assessment indicators in terms of content, logical, and construct validity to make them valid
2. Based on the coefficient value in the table for 4 raters and a level of 0.01 with 20 items, the coefficient value of v table aiken is 0.92, causing 18 valid items and 2 invalid items. For items that are not valid, revisions are made according to the assessment indicators in terms of content, logical, and construct validity to make them valid

The reliability coefficient value of Cronbach's alpha is 0.722. The minimum standard value for Cronbach's Alpha assessment is 0.70. Thus, from the results of the calculation of students' daily test scores, the Cronbach alpha coefficient value was 0.722. This value indicates that the score obtained by students is in the criteria of a reliable level and the value obtained is included in the reliable criteria because the Cronbach's Alpha value is > 0.60.

The distractor options on the daily math test questions on the topic of statistics show that from the 20 daily test questions there are 13 questions in the very good category, 6 questions in the good category, and 1 question in the bad category. The criteria for determining the quality of a good question based on the effectiveness of the distractor option, it is found that the questions made are in the good or very good category. The criteria for determining whether one is very good according to (Halik et al., 2019) is determined if there is a maximum of 1 option that is not selected at least 5% of the test takers or all distractors on a question are selected at least 5% of the test takers then the questions made are included in the test. good category and the questions are eligible to be used as test questions. While the questions that fall into the bad category can be used as test questions with improvements first.

The difficulty level of the questions is divided into three types, namely easy, medium, and difficult. This is reinforced by the opinion of Yusrizal, et al, (2015) which states that the level of difficulty in the questions is the portion of the number of students who correctly answer a question with all students who can work on the questions, so that this category of questions can be obtained including easy, moderate, and difficult. The results of the item analysis carried out above show that the daily test questions on statistics material are in the medium category. With this moderately dominant question, the learning outcomes obtained are evenly distributed. The results obtained indicate that the highest score obtained is 100 and the lowest score is 50. The highest score is obtained because students have a good level of understanding in learning the material. As for the lowest score, this is because students are unable to understand the material being taught, lack of motivation, and enthusiasm for students in participating in learning activities. In addition, student learning environment factors that support learning also affect student learning outcomes.

The results of the calculation of the different power index of daily test questions on the topic of statistics show that the questions in the low category are 10%, the questions in the medium category are 40% and the questions in the high category are 50%. These results indicate that the daily test questions on the topic of statistics are in the good category because the level of discrimination is evenly distributed between students in the high group and also students in the low group.

Based on the results of the analysis above, it shows that the learning carried out is going well, the objectives of the learning process carried out can be achieved well and the learning outcomes obtained by students are good. In addition, the results of item analysis conducted on Bloom's taxonomy analysis, validity, reliability, effectiveness of question options, level of difficulty analysis, and different analyzes showed that daily test questions on statistics topics for class VIII SMP Muhammadiyan Boarding School Klaten were in good category, students are able to understand the material taught by the teacher well, and the questions prepared by the teacher are suitable for use as an assessment

# CONCLUSION

The results of the item analysis carried out showed that the cognitive level analysis was based on Bloom's taxonomy, the successive validity was C1: 5%, C2: 20%, C3: 45%, C4: 25%, C5:5%, the validity was carried out shows that the daily test questions on statistical material are in the valid category, the reliability that is carried out is that the reliability coefficient value of Cronbach's alpha is 0.722, which is greater than the minimum standard value of Cronbach's alpha assessment, which is 0.70. This value indicates that the score obtained by students is in the criteria of a reliable level and the value obtained is included in the reliable criteria because the value of Cronbach's alpha > 0.60. The analysis of the level of difficulty shows that the daily test questions of mathematics on statistics material show the results that the questions are in the medium category. With this moderately dominant question, the learning outcomes obtained are evenly distributed. The level of difference analysis shows that these results indicate that the daily test questions on the topic of statistics are in the good category because the level of discrimination is evenly distributed between students in the high group and students in the low group. Based on the results of the analysis of daily test questions on the topic of statistics at SMP MBS Klaten, it shows that the analysis made by the teacher has good quality and is suitable for use as an assessment of student understanding and achievement of learning objectives

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