DEVELOPMENT OF STUDENT ASSESSMENT INSTRUMENTS BASED ON COGNITIVE ASPECT SCIENCE APPROACH TO PHYSICS LEARNING IN DYNAMIC FLUID MATERIALS

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Abstract

This study aims to determine the validity of the instrument and determine the level of effectiveness of the development of assessment instruments for learning outcomes of cognitive aspects based on scientific approaches to dynamic fluid material based on the assessment of experts, teachers and class XI students of SMA Negeri 1 Stabat. The type of research used is research and development (R&D) using the 4-D model. The subjects in this study were 2 expert lecturers, 1 physics teacher, 9 small group test students and 33 large group test students. The object of this study is the validity and effectiveness of the instrument. The results of the experts' assessment showed the Aiken V index of 0.95 (good validity). The results of the validity of a small group test, 15 valid questions, and effective questions. While the results of the validity of a large group test, 12 valid questions, and effective questions. Then the development of student learning outcomes assessment instruments based on a scientific approach to class XI dynamic fluid material gets decent criteria and excellent assessments based on the criteria of experts, teachers and students.

Keywords: assessment instruments, learning outcomes, scientific approaches, dynamic fluids

As a benchmark to find out the magnitude of the success of students in the learning process is by evaluation. In the opinion of Mehrens and Lehmann (Purwanto, 2011), in a broad sense the evaluation is a process of planning, obtaining and providing information that is very necessary to make alternative decisions. In learning, evaluation is indeed very important. Apart from being a measure of students in achieving learning objectives, evaluation is also used to measure the success of teaching programs. Evaluation activities are one of the important tasks that must be carried out by educators to measure and control the quality of education. One subject that is never separated from evaluation is Physics. To find out whether the learning objectives have been achieved, the evaluation needs to be supported by instruments that are in accordance with the characteristics of the objectives (including competency standards and basic competencies), and are carried out periodically and continuously. knowledge insights, attitudes and social skills achieved by students.

Based on preliminary studies that have been conducted by researchers at SMA N 1 Stabat, an interview was obtained from one of the physics teachers that the teacher was still having difficulty making students' cognitive assessment instruments based on a scientific approach. In this context, the teacher still experiences obstacles in compiling or making students' cognitive assessment

instruments based on a good scientific approach to measuring the level of student success in understanding the material being taught.

One of the assessment methods is able to measure the level of student success and understand the material taught by the assessment and development (R&D) method with the 4-D model. Assessment based on a scientific approach; these problems can hopefully be resolved. This is based because the scientific approach is directed to determine students' reasoning abilities.

Based on the above problem, the author wishes to conduct research to find out student learning outcomes which can be improved by the title of the development of student learning outcomes assessment instruments based on a scientific approach.

RESEARCH METHODS

This research was conducted at Stabat 1 High School even semester 2018/2019 Academic Year. The population in this study were all students of class XI MIA Academic Year 2018/2019. The sample in this study consisted of two classes, namely class XI MIA 1 as a small group test, and class XI MIA 2 as a large group test, each consisting of 9 people and 33 people.

This study involved two classes, namely the small group test and the large group test. The method used in this research is Research and Development (R&D) with a 4-D model. The flow of this research can be seen in Figure 1 below.
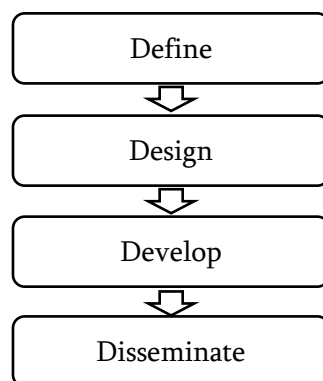

Figure 1. 4D Development Model

This development model consists of 4 stages, namely the Define Phase which consists of 5 main steps, namely front-end analysis, student analysis, task analysis, concept analysis and specification of learning objectives. The design phase (Design) consists of 2 steps, namely the design and preparation of assessment instruments. The development phase (Develop) consists of 3 steps, namely validation by the material expert team, and a small group trial involving 9 students of class

XI MIA 1 and a large group test involving 33 students of class XI MIA 2. Disseminate stage which is the last stage of the product publishing stage.

The types of data used in this research development are quantitative and qualitative. Quantitative data were obtained from questionnaire responses from the teacher, and test data for the item analysis. Qualitative data were obtained from responses and suggestions given by validation experts and teachers as practitioners.

Research development is complemented by the use of research instruments. The research instrument was in the form of a validation sheet by a team of material experts as well as a questionnaire on responses to assessment instruments based on a scientific approach to dynamic fluid material.

In the validation test the data obtained from the responses of experts in the form of scores. In addition to expert response data on small group and large group tests also obtained student learning outcomes data which will be used to determine the item analysis in the form of validity, reliability, level of difficulty, distinguishing power and the effectiveness of deceivers. The item analysis was obtained using the product-moment correlation formula (Sugiyono, 2012), and Kuder-Richardson-20.

RESULT AND DISCUSSION

Research Result

This research was conducted to analyze the quality of cognitive learning achievement test items on Dynamic Fluid material in SMA N 1 Stabat based on qualitative analysis covering aspects of material, construction, and language and based on quantitative analysis covering validity, reliability, level of difficulty, distinction, and deception effectiveness. This research is a research and development based on 4-D models (four-D models) according to Thiiagarajan, namely through the stages of defining, designing, developing, and disseminating.

The data described in this study include data on the validity and effectiveness of student learning outcomes assessment instruments on dynamic fluid material, which are tested on different groups namely 1) small group tests, 2) large group tests. The results of small group and large group test data can be shown in figures 2 and 3:
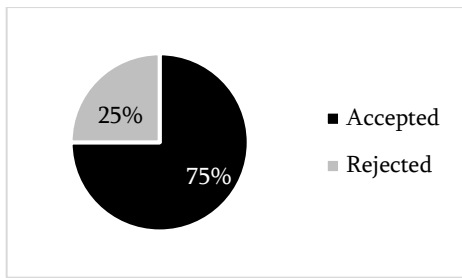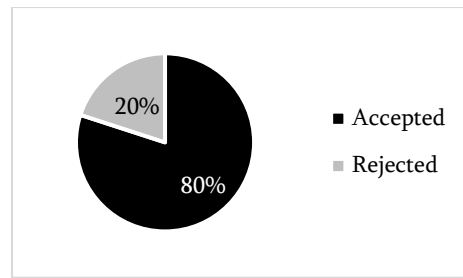
Figure 2. Small group test data

Figure 3. Large group test data

Based on the data picture above, it can be seen that 15 items (75%) can be received and stored in the form of cognitive learning test questions on Dynamic Fluid material in SMA N 1 Stabat and tested on large group trials because it meets the validity, difficulty level, distinguishing features, and good deception effectiveness. There were 5 items (25%) that were rejected and could not be used because they did not meet any of the validity criteria, the level of difficulty, distinguishing features, and good deception effectiveness. While from the results of the large group trial, it was obtained that received 12 items (80%) and 3 items (20%) which had to be rejected.

Discussion of Research Results

Qualitative Analysis of Questions

The results of the analysis of Cognitive Learning Outcomes Test items on Dynamic Fluid Material in SMA N 1 Stabat have a general rating of validator of 0.95 which means all items are valid but there are some that may be used with minor revisions.

Quantitative problem analysis

The results of the study stated that the Cognitive Learning Outcomes Test on Dynamic Fluid Material in SMA N 1 Stabat was good enough. Test reliability was calculated using Kr-20. In the small group trials, the reliability obtained was 0.963942007 while in the large group trials it reached 0.819370841. While the reliability reached 0.763, it means that the tests used already have good reliability.

For items that are classified as good is a moderate level. From the data analysis, in the small group trial it was obtained 6 items (30%) in the easy category ($p > 0.7$), 12 items (60%) in the medium category ($0.3 < p \le 0.7$), and 2 items (10%) in the difficult category ($p \le 0.3$). While in the large group trial 2 items (13.3%) were obtained in the easy category ($p > 0.7$), and 12 items (80%) in the moderate category ($0.3 \le p \le 0.7$), and 1 item (6.7%) in the difficult category ($p < 0.3$). Thus the level of difficulty of cognitive learning achievement tests on Dynamic Fluid material describes the level of

difficulty of the high, medium, and low ranges.

From the results of small group trial research, 11 items (55%) have excellent differentiation, 4 items (20%) have good differentiation, 1 item (5%) has poor differentiation, 1 item (5) %) have enough distinguishing power (0.2-0.29) and 3 items (15%). While in the large group trial, 9 items (60%) had excellent differentiation (0.5-1.00), 3 items (20%) were good (0.3-0.49), 1 item (6.7%) poor (0.00-0.19), and 2 items (13.3%) were very bad (<0.00). Thus, for tests of cognitive learning outcomes in Dynamic Fluid material describe a good differentiating power if it has a point-biserial correlation coefficient ≥ 0.20.

The test participants in the small group test were 9 students. So if counted 5% of 9 students is 0.45 which means that in this test a deception is said to be effective if at least 1 student is chosen. The results of the recapitulation analysis of the deception effectiveness showed that 5 questions (25%) were not functioning optimally and 15 (75%) questions were functioning optimally. Test participants in the large group test were 33 students. So if counted 5% of 33 students is 1.65 which means that in this test a deception is said to be effective if at least 2 students are chosen. A good tricker is if the lower group is selected. Deception is said to function if all the deceivers on each question function well, if the deception turns out not to function or is misleading then the deception needs to be revised.

The results of the recapitulation analysis of the deception effectiveness showed that 3 (20%) questions were not effective and 12 (80%) questions were effective. Based on the data above, it is known that 12 items can be received and stored in the Cognitive Learning Outcomes Question bank on Dynamic Fluid Material in SMA N 1 Stabat because it fulfills validity, difficulty levels, differentiating power, deception effectiveness, which is good. There were 3 questions that were rejected and could not be used because they did not meet the validity criteria, the level of exchange, differentiation, and effectiveness of good deceivers.

This study uses a classical theory where the conditions and characteristics of test takers will influence the results of the study. The conditions in question are internal factors and external factors test takers. Internal factors include the level of intelligence, motivation, health and so on. While the conductivity of the examination room is one of the external factors which also influences the condition of the test takers. The more conducive the examination room, the better the results. The lower the ability of the group of test participants, the more difficult the test items are and vice versa and vice versa (Adeleke & Joshua, 2015).

CONCLUSIONS

The conclusions that can be drawn from this research development refer to the research objectives and the discussion are as follows:

1. Judging from the qualitative analysis, the quality of cognitive learning test results on Dynamic Fluid material in SMA N 1 Stabat is very good with an average general assessment by a validation test expert of 0.95, meaning that a valid test with conditions may be used.

2. Judging from the quantitative analysis, the quality of cognitive learning test results on Dynamic Fluid material in SMA N 1 Stabat is very good. Analysis of 20 items obtained 15 (75%) items can be accepted and stored in the bank of cognitive learning test questions on Dynamic Fluid material in SMA N 1 Stabat, 5 (25%) items were rejected because it did not meet any validity criteria, difficulty levels, distinguishing features, and good deception effectiveness. From the validity of the items obtained 12 valid items (80%) and 3 invalid items (20%). Based on reliability, the questions have good reliability that is 0.819370841. Based on the level of difficulty as many as 2 items (13.3%) in the easy category ($p > 0.7$), and 12 items (80%) in the medium category ($0.3 \leq p \leq 0.7$), and 1 item questions (6.7%) in the difficult category ($p < 0.3$). Based on the distinguishing power of 9 items (60%) have very good distinguishing power (0.5-1.00), 3 items (20%) are good (0.3-0.49), 1 item (6, 7%) poor (0.00-0.19), and 2 items (13.3%) are very bad (<0.00). And based on the effectiveness of deceit, it shows that 3 (20%) questions are not yet effective and 12 (80%) questions have been effective.

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