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Analysis of the Needs of Higher Order Thinking Skills (HOTS) Using A Four Tier Type Test Diagnostic Instrument in Learning Physics

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ABSTRACT

The preliminary study in this study describes the need for test evaluation in the learning process for teachers and students in public high schools in the Bekasi district. This study consisted of field observations. The objectives of this study were (1) to determine the form of tests conducted by the teacher, (2) to determine the cognitive level of the tests used, (3) to examine the constraints and barriers that occurred to students in the learning process, (4) to explore the teacher's needs for the test. Four tiers as a learning evaluation. The subjects of this study were students in high schools (SMA) and physics teachers at school. The sample was randomly selected with 60 students and 5 teachers in the three schools. The results of the analysis show that students and educators need an evaluation tool for the assessment of student learning outcomes in the form of a four-tiered or four-tiered multiple-choice diagnostic test. This test can be used to reveal misconceptions or understanding of students about material that has not been understood, besides that it can measure students' higher-order thinking skills.

Keywords: evaluation, test, four-tier, higher-order thinking skills

INTRODUCTION

A learning process, of course, has an evaluation. One of the problems that occur in the world of education in Indonesia is the low level of evaluation tools in learning. This learning evaluation is a measurement and assessment of the learning process where educators assess the activities and interactions of students using test kits. The purpose of learning evaluation is of course to find out whether the learning process of students in following the learning implementation plan is implemented or has deficiencies in the learning process, to find the best solution to achieve educational goals. The importance of learning evaluation for students is to measure the achievement of success in following the learning process that has been given by the educator.

In physics learning, in particular, the purpose of learning is to deliver students to understand physics concepts and connect with everyday life.In the 2013 curriculum, efforts to improve the curriculum, curriculum revisions were again carried out in 2017 with improvements in strengthening character education (PKK), literacy movements, 21st-century skills known as 4C (creative, critical thinking, communicative and collaborative), and integrating HOTS (Higher Order Thinking Skills) or higher-order thinking skills in learning [1]. Students' high-level thinking skills are based on the results of the Program for International Student Assessment (PISA) which shows that the achievement of reading literacy, mathematical literacy, and scientific literacy of Indonesian students is very low [2]. In connection with the four main points of the education policy "independent learning" which was initiated by the Minister of Education and Culture, one of which is about the implementation of the National Examination in 2021. Minister of Education and Culture Nadiem Anwar Makarim explained that "The implementation of the UN in 2021 will be changed to a Minimum Competency Assessment and Character Survey which consists of the ability to reason using language (literacy), the ability to reason using mathematics (numeracy) and strengthening character education. " [3]. Also, Nadiem said in his speech, "To be able to answer multiple choices, the child must be able to understand paragraphs, understand arguments and also read the diagram, to understand what is meant by the visual display of the salt. This is from PISA, ladies, and gentlemen. [4] Following the 2013 curriculum and educational policies regarding "independent learning", a good assessment is needed to assess learning activities. To measure the ability of students to the material presented in the learning process, of course, an assessment process must be carried out. Tests are structured performance situations that can be analyzed to produce a numerical value, which can be used to deduce individual differences in the constructs of performance measured through testing. [5] Tests conducted in schools today still tend to use multiple choice in general. Multiple choice has weaknesses to be an assessment of learning outcomes, including

ineffective in measuring several types of problem-solving, the ability to organize and express ideas. In this regard, there are already several schools that use multiple-choice tests in other forms. An assessment can find out the learning difficulties experienced by students in the learning process. Based on the results of the assessment, it can be seen that the material/competencies have not been understood or achieved by students. In the 2013 curriculum, it is related to the difficulty of assessing students both attitudes, knowledge, and skills. Assessment of the knowledge aspect by conducting tests of student learning outcomes [6]. In its function, the test is divided into four, namely formative assessment, summative assessment, placement assessment, and diagnostic assessment [7]. Diagnostic tests are used to identify problems or learning difficulties of students so that in compiling a diagnostic test, it must be designed with the format and response that is owned by the diagnostic test [8]. The most commonly used tests are formative and summative. The four-tier test is a development of the three-tier multiple-choice diagnostic test. Four Tier consists of four levels including the first level, contains multiple-choice questions with three distracting answers, and one answer that students have to choose. The second level contains the level of confidence in choosing answers. The third level contains students' reasons for choosing answers consisting of three choices of reasons provided and one open reason. The fourth level contains the level of students' confidence in choosing reasons [9]. According to Nugroho, the high-order thinking ability in [10] is defined as the ability to apply knowledge by including analyzing, evaluating, and creating activities in solving problems. The high-level thinking process by solving a problem that is then analyzed, analyzed, and given a solution will help students think. Four-tier questions can also be used to test students' understanding and identify misconceptions. According to Cullinane in [11]. The second tier of two-tier multiple-choice questions can be used for students 'higher-order thinking skills and seeing students' ability to provide reasons. Inclusion second stage to reduce the occurrence of fortune is often a weakness of the form of multiple-choice questions in general. Similar to the form of two-tier questions on four-tier questions, there are reasons that students must answer to understand the conceptual understanding of the material that has been given. This study aims to: (1) determine the form of the test conducted by the teacher, (2) determine the cognitive level used, (3) examine the constraints and barriers that occur to students in the learning process, (3) explore the teacher's needs for the four test tier as a learning evaluation.

RESEARCH METHOD

This study used an observation method in the field which was carried out on January 8-24 2020 in three State Senior High Schools (SMA) in Bekasi Regency. The sample used was random sampling, with research subjects totaling 60 students and 5 teachers in three high schools.

Data collection techniques by distributing needs analysis questionnaires to teachers and students. The questionnaire was used to obtain data in the field regarding the experiences and needs of students. The research data were analyzed descriptively and qualitatively. The process of processing and analyzing data is carried out in four stages.

The first stage is data from the results of the questionnaire distribution. The second stage of data tabulation is adjusted according to class, nature, and type for easy reading and analysis. The third stage of data analysis is carried out qualitatively, namely analyzing by explaining and relating the data that has been obtained with the research. Stage four is defining the results of the analysis following the existing statements and problems and making conclusions.

RESULTS AND DISCUSSION

In this study, conducting activities by analyzing the results of the needs questionnaire that had been distributed to students in three MIPA schools.

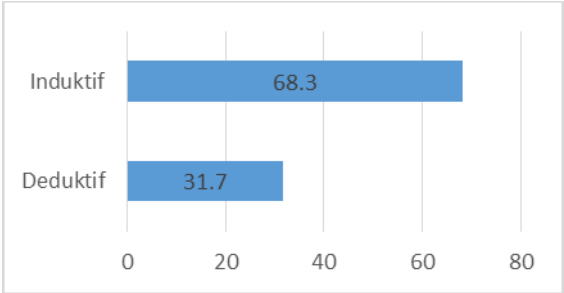

Figure 1. Learning Strategy

The data obtained from students showed that teacher learning strategies were more likely to teach inductively.

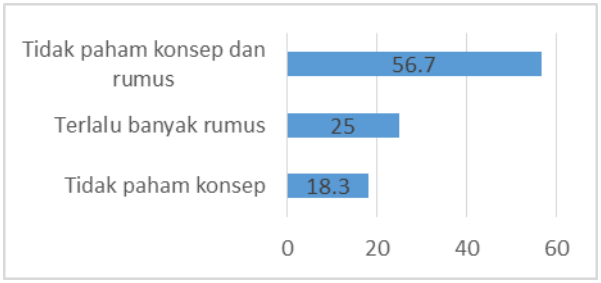

Figure 2. Physics Lessons Difficult

Students reveal that physics is difficult because they do not understand the initial concepts of material and formulas that are poorly understood.

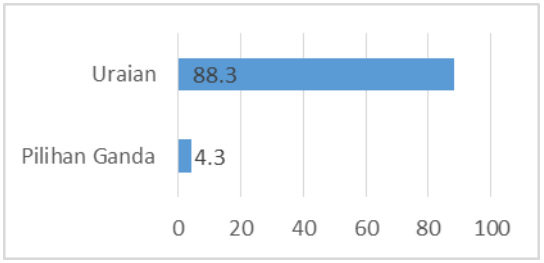

Figure 3. Test form

In terms of learning evaluation with tests as a tool in the assessment. Students revealed that the form of tests used by many educators still used descriptions.

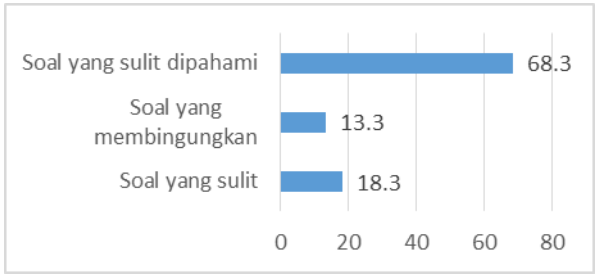

Figure 4. Problem HOTS

According to students, HOTS questions were difficult for them to understand, so that in the process, students found it difficult to solve questions.

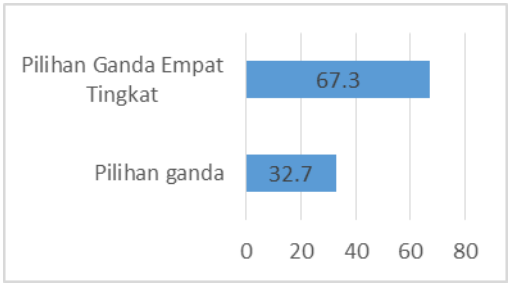

Figure 5. HOTS Test Form

Students reveal that a four-tier multiple-choice test or four-tier multiple choice can be used to test higher-order thinking skills or Higher-Order Thinking Skills. Analyzing the results of a questionnaire on the needs of physics subject teachers that have been distributed in three public high schools in the Bekasi Regency. This questionnaire is analyzed to obtain the information needed by the teacher in evaluating learning.

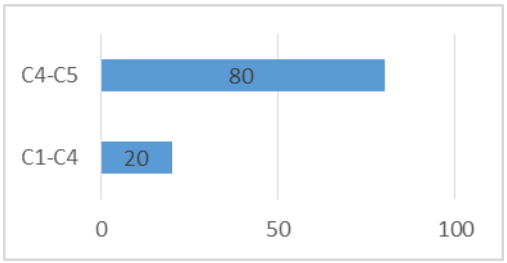

Figure 6. Cognitive Domain

The cognitive domain used by educators in making tests or questions averaged at C4. In this case, the teacher has used the HOTS test in the learning process.

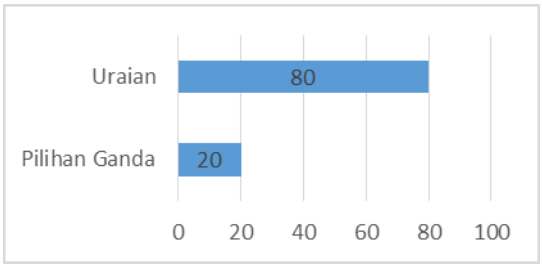

Figure 7. Test Form

The view of educators regarding the form of the average test still tends to use the test in the form of a description as a tool for assessing student learning outcomes.

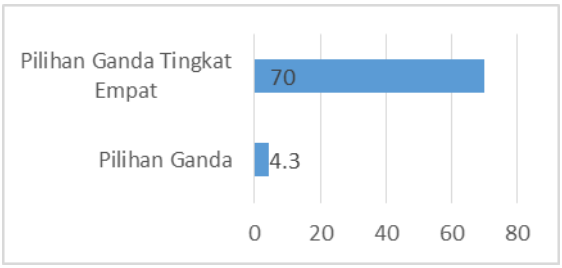

Figure 8. HOTS Test Form

Educators 'perspective on the test in the form of multiple-choice four or four-tier is considered sufficient to be used as a test in measuring students' higher-order thinking skills.

From the questionnaire that has been distributed, it can be formulated that: (1) educators and students need a four-tier multiple-choice test or four-tier multiple choice in addition to uncovering the misconceptions that occur to find out the higher-order thinking skills of students in the learning process. (2) the test questions are designed to be simple and easy to understand by students without reducing the steps for preparing the HOTS test or diagnostic tests. (3) assisting students and educators in identifying weaknesses in the competencies or material provided.

CONCLUSIONS

Based on the results of the study on needs analysis research, it can be concluded that: a. The evaluation of the four-tier test is assessed by teachers and students as still minimal or of little use in the learning

process, b. Teachers and students need evaluation tools that can reveal misconceptions to be able to understand the concepts in the provision of teaching materials so that they can help students in higher-order thinking, c. The teacher can design a good evaluation tool to see the ability of students to understand the concept of the material given in the physics learning process.

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