The analysis of how physics teachers comprehend the authentic assessment at senior high schools

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Abstract. This research aims to find out the level of physics teachers’ understanding of authentic assessment. The research method used was descriptive analysis with a quantitative approach. The population in this research were 56 physics teachers at the State Senior High Schools in Banda Aceh. Thirty (30) physics teachers were selected as the sample in which two teachers were representing each school. This study used the questionnaire as the research instrument in which the reliability was 0.9 and documentation. The research data were analyzed using descriptive statistics technique. The results of the research showed that the understanding level of physics teachers on authentic assessment was; planning 74% (understanding), implementation 79% (understanding), analysis and reporting 70% (understanding), attitude assessment techniques and instruments 71% (understanding), knowledge assessment techniques and instruments 78% (understanding), and skills assessment techniques and instruments 77% (understanding).

1. Introduction

Based on the regulation of Minister of Education and Culture of Indonesia (Permendikbud) Number 23 of 2016 on standards for evaluating education, assessment of student learning outcomes in primary and secondary education includes aspects of attitude, knowledge, and skills and the evaluation method used is an authentic assessment [1]. Authentic assessment has strong relevance to the scientific approach to learning following the demands of the 2013 curriculum [2,3]. Due to authentic assessments can describe the improvement of students’ learning outcomes, such as to observe, give a reason, try, build networks and others. Authentic assessment is the process of collecting information by the teacher about the development and learning achievement carried out by students through various techniques which can express precisely that learning objectives have been truly mastered and achieved [4]. The authentic assessment contains instruments that require students to show performance, not to answer or choose answers from various possible answers [5].

The authentic assessment is also applied to physics subjects. Authentic assessment is very compatible with physics because physics emphasizes not only the cognitive domain but also the affective and motoric domains. Physics learning would be more effective and truly reflects the nature
of physics itself if it is carried out through practical activities and constructing open-ended learning rather than listening passively to lectures [6]. In Physics, students are required to comprehend the knowledge, have good attitudes, and possess scientific skills that include: the ability to use tools and working attitudes, able to analyze a task, and has excellent sequencing skills.

Authentic assessment can assess students' abilities, especially on aspects of attitudes, knowledge, and skills. However, based on a case study report at Public Senior High School 4 Banda Aceh, it was found that teachers had not fully implemented authentic assessments [7]. The teachers claimed that they did not understand authentic assessment and still had difficulties in applying it due to insufficient time of evaluation and teachers were still having trouble in assessing students because they were overwhelmed in carrying out assessments and teaching and learning activities at the same time [8]. Because of that sometimes the teachers still apply traditional assessments in the teaching and learning process. Identical problems were also found at Public Senior High School 11 Banda Aceh, it was also concluded that the teachers still did not apply authentic assessment as a whole because he still did not understand the description of authentic assessment that was so complex and covered too many aspects [9]. The report shows that teachers have not fully applied authentic assessment as expected even though the application of assessment is the main basic ability that must be possessed by every teacher [10].

Research on authentic assessment has been carried out in several regions, but authentic research had not been effectively implemented due to a lack of teachers’ understanding of authentic assessment techniques [11]. Besides, the assessment format was too complicated, and the time in carrying out the assessment that was felt to be lacking was also an obstacle in the implementation of authentic assessments. Then the understanding level of the teacher in aspects of the form of instruments, techniques, and elements of authentic assessment was still low [12]. While in the previous research, the level of understanding of teachers on authentic assessment had not yet been discussed. In this research, the writer tried to observe the assessment technique and instrument, and also how teachers understand the planning, implementation, analysis and reporting the authentic assessment.

Based on the description of the problems, the purpose of this research is to determine the level of understanding of physics teachers on authentic assessment at Senior High Schools in Banda Aceh. The results of this research are expected to be useful to develop insights for all parties who have a role in authentic assessment, and particularly for physics teachers, it can be a reflection and evaluation in the implementation of authentic assessments. Also, the results of this research are expected to be taken into consideration by schools and governments in developing the quality of physics teachers related to authentic assessment.

2. Method
This research uses descriptive analysis method with a quantitative approach. The population in this research were 56 physics teachers spread across 16 high schools in the city of Banda Aceh. All of these schools have been implementing the 2013 Curriculum since the 2013/2014 school year until now. The researcher then took 30 physics teachers as the sample using random sampling technique in which two teachers representing each school (but two schools only have one sample was taken because there was only one physics teacher at the school). The data in this research were collected using a questionnaire instrument. Questionnaire research uses a Likert scale consisting of 38 items statement whose substance includes indicators of teacher understanding of authentic assessment. Before using the questionnaire instruments, it was reviewed by two experts. After that, the validity and reliability tests were carried out. The result of the validity test revealed that four items were invalid statements so that only 34 statement items were used in the questionnaire. The reliability test results showed that the questionnaire has an outstanding level of consistency with a coefficient of 0.9. Based on the expert review, validity test, reliability test, and repairs were made to produce instruments that are suitable and ready to be used.

The data collected was then analyzed based on the results of the questionnaire scores. Each acquisition of scores from each item will be accumulated and then calculated on average for each
indicator. The scores that have been obtained were then interpreted on the level understanding of physics teachers into five categories, as shown in Table 1 [13].

| No | Score | Category          |
|----|-------|-------------------|
| 1  | \( X \geq (\mu+1,5\sigma) \) | Understand well   |
| 2  | \((\mu+0,5\sigma) \leq X < (\mu+1,5\sigma)\) | Adequately Understand |
| 3  | \((\mu-0,5\sigma) \leq X < (\mu+0,5\sigma)\) | Fairly Understand |
| 4  | \((\mu-1,5\sigma) \leq X < (\mu-0,5\sigma)\) | Less Understand |
| 5  | \( X < \mu-1,5\sigma \) | Does not understand |

Description: \( \mu = \frac{1}{2} (\text{Highest Score} + \text{Lowest Score}) \) \( \sigma = \frac{1}{6} (\text{Highest Score} - \text{Lowest Score}) \)

3. Results and Discussion

Physics teacher understanding indicators consist of 6 indicators with a total of 34 statement items. The following is the percentage of the average score for each indicator of the physics teachers’ understanding of authentic assessments obtained from the results of the questionnaire given to the physics teachers of Senior High Schools in Banda Aceh.

| No | Indicator                                      | Score (%) | Category |
|----|-----------------------------------------------|-----------|----------|
| 1  | Planning                                      | 74        | understand |
| 2  | Implementation                                | 79        | understand |
| 3  | Analysis and reporting                        | 70        | understand |
| 4  | Attitude Assessment Techniques and Instruments | 71        | understand |
| 5  | Knowledge Assessment Techniques and Instruments | 78       | understand |
| 6  | Skills Assessment Techniques and Instruments   | 77        | understand |

Based on the results data in table 2, the highest level of teachers’ comprehension regarding the authentic assessment is on the implementation, while the lowest level can be seen in the analysis and reporting the authentic assessment. However, the percentage gained for each indicator in the category of adequate in which above 70% categorized as understand well. It shows that the teachers already understand the authentic assessment in term of its planning, implementation, analysis and reporting, and also the technique and instrument for the behavioral, knowledge, and skills evaluation.

3.1. Authentic Assessment Planning

The research found that 74% of the total sample understood well. Authentic assessment planning is an activity carried out by the teacher before carrying out the assessment. The plan is an essential part of a teacher's workload because it will support an authentic, relatively complex assessment process [14]. Without proper planning, the assessment and learning process will not run smoothly and successfully. Based on the results of eight aspects of the analysis of authentic assessment planning indicators, it was found that the teacher was able to understand the authentic assessment plan well. It is evidenced by several documents given to the author including the design of the implementation of learning, the assessment rubric of attitudes, knowledge, and skills, the minimum completeness criteria (KKM), to remedial programs and enrichment. From the documents and questionnaire data collected show that the teacher has been able to plan the planned and programmed assessments to support the quality of learning. Similar results were also which concluded that teachers already understood well how to plan an authentic assessment [15].
3.2. The Implementation of Authentic Assessment

In the implementation of the assessment, the teachers understanding were essential matters relating to authentic assessment. At the beginning of learning, the teachers understand that there is an obligation to inform students of the competencies and assessment techniques used. The information is important so that students have the readiness to face the assessment given by the teacher. The teachers generally understand that before the assessment is done, it is necessary to agree with the assessment procedures and criteria. The preparation of procedures and assessment criteria fosters the attitude of students' responsibility in carrying out learning. The teachers understand that in the learning process, the teachers must carry out an assessment following what has been agreed. It is an example of a good example so that it can maintain students' trust in the teacher. After learning is done, the teacher understands that the assignment or homework that has been collected must be returned to students accompanied by comments. Returning the results of the assessment is the right of students as a form of teacher accountability in the form of responsibility for assessment results [16]. One of the results of the assessment functioned for the teacher to carry out follow-up actions in the form of remedial and enrichment. The teacher understands that the results of the assessment must be utilized in this follow-up activity.

Based on the research of documentation results, it was found that teachers understood the implementation of authentic assessment. The teacher has a format and assessment instrument in aspects of attitudes, knowledge, and skills [17].

3.3. Analysis and Reporting of Authentic Assessment

The results of the research show that the level of teachers’ understanding of authentic analysis and reporting was 70% with the understanding category. The results of the documentation collected also support this. In analyzing the results of the assessment, the teachers adjust the data that has been collected with the scoring guidelines and the assessment criteria at the beginning of the lesson. So that the results of the assessment are more objective and reduce the subjectivity of the assessor under the principle assessment [16]. The teachers always provide remedial for students who have not reached KKM. Remedial aims to improve and help students who have difficulty in achieving expected learning outcomes. In its implementation, the teachers help students who have problem learning through individual or group guidance, re-learning, or the use of peer tutors. In addition to remedial, the teachers also provide enrichment for students who reach or exceed KKM. Enrichment focuses on deepening and expanding the basic competencies learned. In analyzing the results of the assessment, the teachers combine the results of the analysis of the various data or information obtained following the assessment aspects. For example, in the element of knowledge assessment, the teachers combine the values of assignments, oral and written, to achieve valid and appropriate assessment results for each basic competency.

It was found that teachers had documented the results of the assessment systematically, meticulously and neatly. Is can be proven by the documentation of a complete and appropriate recapitulation following the assessment guidelines [16]. In addition to writing the results of the assessment in numbers, the teachers also make a narrative description of the scores which students received — writing this description as a guide for teachers and guardians of students to find out the results of children's learning development.

3.4. Attitude Assessment Techniques and Instrument

The results of data analysis on techniques and instruments in assessing attitudes were 71% and in the category of understanding. Analysis of the engineering components and attitudinal assessment instruments includes observation techniques for evaluating student behavior, recording any very good (positive) and less functional (negative) behaviors that arise from students, and compiling students’ academic records.

The results of the research show that teachers use observation techniques in assessing student behavior. Observation techniques are used to monitor, describe, classify, and analyze with particular
attention directly or indirectly [18]. The results of observations made by the teachers are then recorded in the attitude assessment journal. From the results of documentation, it was found that the journals owned by the teachers were already filled in, and some were still empty. In the attitude assessment journal that has been filled, it is found that the teachers fill in events that are not only negative but also positive. This filling is following the assessment guide that the journal contains a record of student attitudes that are very good and not good. Besides, there was also found an attitude assessment journal sheet that still had not been filled in at all, even though the learning activities were nearing the Final Semester Assessment. The teachers admitted that they often did not carry the assessment format, so they only gave follow-up without writing it in the attitude assessment journal. As a result, authentic assessment has not run entirely because it is not following the assessment guide, where the teacher is obliged to record the students’ attitude assessment in the journal [16]. Besides, to use observation techniques, teachers also use self-assessment and peer assessment in assessing student attitudes. The results of self-assessment techniques and evaluations between friends are used as one of the data to confirm the results of attitude assessment by the teachers.

3.5. Knowledge Assessment Techniques and Instruments
The results of data analysis on knowledge assessment techniques and instruments obtained an average score of 78% with the understanding category. So it means teachers have carried out authentic assessments on aspects of knowledge [19]. Based on the results of the research, it was found that teachers gave assignments to students. Giving assignments consist of two types, structured assignments and independent formal assignments. Structured tasks are activities that deepen the material with the completion time determined by the teacher, while the independent tasks are not structured when students arrange the completion. This assignment has a positive impact on improving student learning outcomes, and by giving assignments in learning physics can increase the average value of student learning outcomes [20].

The results of the research showed that teachers held a pretest and posttest in learning. For the implementation of the pretest, the teachers generally used oral questions randomly to test the initial ability before learning begins. The teachers claimed to use oral questions to save learning time. As for the posttest, written tests were often used, both in the form of multiple choices, descriptions, short, matchmaking, or incorrect. Variations of this written test are correct. In accordance with Rokhyani’s opinion, the teacher should add another variable in the assessment of the knowledge, not only in the form of multiple choices and descriptions [21]. The teachers have also used Higher Order Thinking Skills (HOTS) type questions on the assessment instrument. This is evidenced by the documentation of the question grid analysis which contains questions about the indicators, the cognitive domain, the question card, the form of the test, to the score and the answer key to the question. The HOTS problem is useful for honing students’ ability to solve problems, construct explanations, hypothesize and understand complex things more clearly. The results of the research also found a weakness in the realization of knowledge assessment, namely the remedial assessment that has not been recorded. Remedial has been carried out by the teachers, even though many teachers do not take notes on the remedial program sheet. The recording should be done to determine the progress of the development of student knowledge in each basic competency.

3.6. Skill Assessment Techniques and Instruments
The results of the questionnaire processing showed that the teachers understood the skills assessment techniques and instruments. The results of the interviews indicated that the implementation of skills assessments is good because all schools tend to have adequate laboratories, libraries, and internet facilities. In daily learning, the teachers have measured the students’ skills through the observation process with the percentage of implementation reaching 76%, which is meaningful when the learning takes place in large part that the teachers have observed and assessed the students’ skills. These results are also in line with Rahman’s findings that teachers have understood authentic assessment techniques and instruments in the aspects of skills in the form of projects, products, performance, and portfolios.
[22]. In addition, it was also found that teachers were able to measure students’ skills in demonstrating something related to learning. This assessment of proficiency is important in physics learning because it concerns the suitability of the theory being studied and the results of demonstrations that will be obtained.

In observing students’ skills, the teachers used the assessment rubric that had been prepared in advance. It can also be proven by the results of documentation in the form of skills assessment rubrics based on performance, products, projects, presentations, and portfolios. The use of rubrics in assessing is very important because it providing transparency to the assessment [23]. However, the realization of authentic assessments still has weaknesses. The teachers have an authentic assessment rubric, but difficult to observe students one by one, so that filling out the skills assessment sheet is carried out after the implementation of learning rather than during the learning process. The same thing also happened in the results of Rukmana’s research describing that educators usually conduct holistic assessments at the end of teaching and learning activities [18].

4. Conclusions
Based on the results, it can be concluded that the level of understanding of physics teachers on authentic assessment at Senior High Schools in Banda Aceh includes; planning of 74% (understand), implementation of 79% (understand), analysis and reporting of 70% (understand), attitude assessment techniques and instruments by 71% (understand), knowledge assessment techniques and instruments by 78% (understand), skills assessment techniques and instruments 77% (understand).

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