Level of teachers’ knowledge and understanding in developing test questions

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Abstract. This study aims to describe the level of knowledge and understanding of state junior high school science teachers in compiling exam questions. This research is a descriptive study with a quantitative approach. The method of data collection was carried out through a survey using the developed questionnaire instrument. The population in this study were all state junior high school science teachers in Pidie District, and 47 teachers were randomly selected to be samples from 60 state junior high schools. The data were analyzed descriptively. The results showed that 67% of science teachers had a very high level of knowledge in preparing exam questions, and 50% had a high level of understanding in preparing exam questions.

1. Introduction
Teacher competence in the learning process greatly determines the academic and non-academic progress of students because the teacher's ability in the learning process is one of the main pillars of improving the quality of education [1]. One of the competencies that teachers must have is able to develop assessment instruments for process learning outcomes [2]. Assessment of student learning outcomes is one of the abilities that must be mastered by a teacher which is included in pedagogic competencies [3]. A teacher must be able to compile exam questions in order to carry out an evaluation to find out whether the provided lesson can be understood by students or not. The ability to compile questions and evaluate learning outcomes is a basic ability that absolutely must be mastered by the teacher. The instrument used in the assessment of learning outcomes must be able to provide an overview of the actual learning abilities of students. The achievement of students’ cognitive competencies in the learning process can be seen from how students solve problems from the provided lesson which is usually manifested in the form of tests [4]. The test is one form of an instrument used to make measurements. A good test will give good results [5]. Special abilities possessed by a teacher to be able to make good questions are: (1) mastering the lesson that being tested, (2) being able to express the idea, (3) understanding the characteristics of the individual that being tested, and (4) master the technique of writing questions [6]. The teacher must always try to develop his ability in making questions. So the teacher, including junior high school teachers who teach science subject should have competence in compiling tests because the test is used as a tool to measure student achievement which can be shown in the form of numerical symbols after following the learning process [7].

The result of the National Examination (UN) Junior High School in Pidie District in 2017/2018 shows the average score of science subjects is 33.30, with the lowest score being 10.0 and the highest
score 72.5 [8]. This is because Junior High School Students in Pidie District are not accustomed to working on science questions that are equivalent to UN questions, for example in the questions that require high-level skills. The unfamiliarity of students working on science questions that demand high-level thinking skills, allegedly because the teacher is not accustomed to giving questions that require high-level thinking skills, for example in semester examinations. The prediction of the cause is that science subject teachers don’t have very good ability to arrange test questions that are equivalent to the national exam questions. It should be suspected that for the purposes of exam questions the teachers usually use the existing test and then adapt it to the teaching book, or because they have not been able to arrange the questions so that the science teachers often search for a number of existing questions. In this regard, this research needs to be carried out. The competence of the teacher in preparing the exam questions can be known through the embodiment in the form of mastering knowledge and understanding in carrying out the function as a teacher [9-11]

Based on the description above, the purpose of this study is to find out: the level of knowledge and understanding of state junior high school science teachers in compiling exam questions. Information on the level of knowledge and understanding in composing questions by junior high school teachers who teach science subjects can be material inputs and considerations to the Pidie District Office in developing teacher quality, especially those concerning the competence of compiling and analyzing exam questions.

2. Research methods

2.1. Research approach
This study uses a quantitative descriptive approach with a type of development research. This research was conducted in the 2017/2018 odd semester towards Pidie District junior high school science teachers. Research activities follow the steps (1) developing questionnaire instruments to assess knowledge and understanding in preparing exam questions, (2) conducting surveys of state junior high school science teachers to determine the level of knowledge and understanding of teachers in preparing test questions using the development questionnaire instrument.

2.2. Data collection
The instrument for assessing knowledge and understanding in compiling exam questions by state junior high school science teachers is referring to the development theory of typical performance instruments [12-14]. The validity of the instrument is determined by using the Pearson product moment correlation formula, namely the correlation between the items with the total [15]. Reliability testing is done with Microsoft Excel 2007. The formula used is the Cronbach Alpha formula [16]. Validity test results obtained 19 valid items. In reliability testing, the instrument reliability coefficient was 0.96. The instrument for assessing knowledge and understanding in composing exam questions filled by state junior high school science teachers uses a type of semantic differential scale which has seven choices, in the form of a continuum scale that contains the state of the teacher's habits in compiling exam questions. The seven answer choices, respondents were asked to choose one answer that best suited the teacher's knowledge and understanding in compiling question he was doing.

2.3. Data analysis
To give an interpretation of the results of the level of knowledge analysis composing the question, categorization was used, namely: if $X \leq 25$ then the knowledge of composing questions is very low, if $25 < X \leq 35$ then the knowledge composes the question is low, if $35 < X \leq 45$ then the knowledge composes the question is medium, if $45 < X \leq 55$, the knowledge in composing question is high, and if $X > 55$, then the knowledge in composing question is very high [17]. Next to give an interpretation of the analysis results of the understanding level of the question used the following categorization, namely: if $X \leq 22.5$ then the understanding of compiling questions is very low, if $23 < X \leq 32$ then understanding in composing questions is low, if $32 < X \leq 41$ then understanding in compiling question is medium, if
41 \leq X \leq 50, \text{ then the understanding in composing question is high, and if } X > 50 \text{ then the understanding of compiling questions is very high.}

\section{Result and discussion}

\subsection{Level of knowledge}

Based on the results of the recapitulation of the level of knowledge of state junior high school science teachers in compiling questions, such as Figure 1. The level of knowledge of state junior high school science teachers in composing questions was 20 people (67\%) very high category teachers, 15 people (50\%) high category teachers, 10 people (33\%) medium categories, 2 people (7\%) teachers categorized low and no teacher (0\%) categorized as very low. Looking at this data, it can be explained that the level of knowledge of most of the Pidie District Junior High School science teachers in arranging questions is in the very high category. In other words, most of the Pidie District Junior High School science teachers already have knowledge in compiling excellent exam questions. To find out the level of understanding of the state junior high school science teacher in compiling the questions can be shown in Figure 2.

![Figure 1](image.png)

\textit{Figure 1} The knowledge level of the state junior high school science teacher in compiling the exam questions

\subsection{Level of Understanding}

The level of understanding of state junior high school science teachers in compiling exam questions is as many as 15 people (50\%) teachers are categorized as very high, 20 people (67\%) teachers are categorized as high, 12 people (40\%) are categorized as moderate, and there are no teachers categorized as low and very low category. So, for the level of understanding in compiling the questions as many as 50\% of the Pidie District Junior High School science teachers are in the high category.

\subsection{Comparison of knowledge and understanding}

Figure 3 is a comparison of the level of knowledge and understanding of Pidie District Junior High School science teachers in compiling exam questions. From Figure 1 and Figure 2 it can be seen that there is a difference in the percentage of the number of teachers between the level of knowledge and the level of understanding in composing the test questions. For the level of knowledge there are 67\% of science teachers already have knowledge, while for the level of understanding there are 50\% of science teachers who just understand it.
Figure 2 The level of understanding of the state junior high school science teacher in compiling the exam questions.

It means that teachers who have the level of knowledge more than teachers who already have the level of understanding. However, this does not guarantee that the teachers are able to arrange questions because to compile or write questions is a skill that is gained from the exercises. To be able to compile items that meet the requirements is quite difficult because compiling items requires quite high knowledge, skills, and accuracy [18]. Writing questions is a process of preparing a measuring instrument to determine the level of students' ability to the material taught by the teacher. This means that the State Junior High School science teachers in compiling the questions are not just knowing and understanding but the more important is having skill in composing or writing questions.

Figure 3. Comparison of knowledge level and understanding level of state junior high school science teachers in Pidie regency in arranging exam questions.

Furthermore, even if the teacher has been able to compile or write questions, it is not guaranteed that fulfills the requirements as a quality question before the validation process or testing is done. According to Purnomo [7] questions that are theoretically good must also be empirically tested in order to obtain certainty of whether they are good or not. Furthermore, the questions that have been carefully written based on consideration, do not directly consider as a good question because they have to be tested through theoretical questioning and empirical testing [13,19]. The lack of teacher skills related to writing
questions shows that teachers still have low competence. One of the competencies that teachers must have is to develop assessment instruments, evaluation process, and learning outcomes. The skills that must be mastered are the student learning outcomes assessment system \[18,20,21\]. In assessing the process and results of student learning, aspects relating to the selection of assessment tools, namely; preparation of questions, analysis of items to obtain adequate quality questions, and processing and interpretation of assessment data. Therefore, a teacher must be able to carry out an evaluation to find out whether the material provided can be understood by students or not. The low competence of teachers also reflects that the school program is carried out with a minimum and has not been implemented properly, the important thing is that the planned program can be implemented even with various limitations, including limited competence \[22,23\]. Knowledge and understanding and skills related to the process of preparing questions are closely related to efforts to improve the quality of education. The quality of learning outcomes as an indicator of the quality of education is determined by the quality of questions and the level of questions developed by the teacher in a quality manner \[24,25\].

4. Conclusions

Based on the results of the description above, it can be concluded: that most of the State Junior High School science teachers in Pidie District already have very high knowledge, and already have a high understanding in preparing exam questions. From the results of the study it is suggested (1) before compiling the questions, the Head of Pidie District Junior High School should first hold a workshop so that the cooperation between State Junior High School Science teachers can exchange information well in an effort to improve school quality as well as training questions writing skills, (2) in carrying out the assignments to compile and analyze questions/tests, all Pidie District Junior High School science teachers should establish cooperation and exchange ideas with other subject teachers.

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