Evaluation of science process skills of high school students in Tapaktuan City on static fluid material

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Abstract. This descriptive qualitative research aims to evaluate the profile of students' physics process skills. This research was conducted at a secondary school in the city of Tapaktuan. The population in this study were all students of class X MIPA SMA in Tapaktuan. The sample in this study was grade X MIPA 3 students who tested 20 people. Data collection techniques were used in this study through a multiple choice test instrument. Profile of high school students 'science process skills in Tapaktuan City, it can be concluded that: the average high school students' science process skills in Tapaktuan City are low (less), 0% are in the high category, 25% are in the medium category, and 75% are in the low category. The achievement of each aspect of skill varies. In the aspect of observation, classification and interpretation good categories, aspects of prediction, hypothesis, selection of variables, conducting experiments and communicating are in the sufficient category, while in aspects of asking questions, planning experiments and applying concepts are in the lacking category. The science process skills of high school physics students in Tapaktuan for each aspect of science process skills are still low, with an average percentage of 48.9%.

1. Introduction
The 21st century is a century of knowledge marked by advancing technological advancements, including education. Education becomes an important part of the national development system to deal with major changes in the era of reform and the process of globalization. The teacher has an important role in the success of students, especially in relation to the learning process.

Education has an important role in the process of building a nation. The world of education is expected to provide professional human resources to advance the country with its knowledge and technology. The existence of educational infrastructure is needed in the education process, so that it is included in the components that must be met in the implementation of the education process [1]. Infrastructure is one of the National Education Standards items. Learning facilities usually support learning achievement, but if inadequate can be a barrier [2]. The more students are presented with a variety of media and supporting infrastructure, the more likely the educational values are able to be absorbed and digested [3]. Quality learning requires learning tools that can help students understand, master, and understand physics material well. Learning tools are a collection of learning resources that enable students and teachers to carry out a process of learning activities that include Learning Implementation Plans, Student Worksheets and Teaching Materials. The big problem in the physics learning process in high school today is the lack of thinking development efforts that lead students to actively solve a problem. the learning process developed at this time is more passive and rote encourages
students to master the subject matter in order to be able to answer all exam questions. This fact shows the tendency of students to be less active in learning activities [4]. In fact, students' ability to solve physics problems is still relatively low. Most students are less able to connect between what is learned with how to apply it to new situations.

Students need process skills both when conducting scientific investigations and during their learning process. Therefore we need a teaching material made by educators with a focus on scientific learning so as to improve students' science process skills. Science process skills are a set of skills that scientists use in conducting scientific investigations [5]. Science process skills consist of basic and integrated science process skills. Basic science process skills consist of observing, classifying, measuring and predicting. Meanwhile, integrated science process skills consist of identifying and defining variables, collecting and processing data, making tables and graphs, describing relationships between variables, interpreting data, designing materials, retrieving data, formulating hypotheses, designing investigations, and drawing conclusions. Science process skills are directed at cognitive and psychomotor abilities to conduct scientific investigations, discover concepts, principles, and theories to develop pre-existing concepts [6]. Process skills can make students actively participate, create long-term learning, form correct habits as a scientist in solving problems and planning experiments, and make students learn how to apply science rather than just learning concepts and laws. The importance of these science process skills is the hope of the curriculum in Indonesia which is implicit in the competency standards of graduate students. Classroom learning is directed so that students are given the opportunity to observe, ask, try, reason, present and create. However, the reality in the field of the learning process that is directed to practice the science process skills is not optimal. In optimizing science process skills in school, various methods need to be done, one of which is to condition the learning environment.

Based on the results of previous research in assessing the improvement of science process skills, it is known that the results of this study indicate that the Science Process Skills and scientific attitudes of students in Pulau Tunda One Roof Junior High are still low. Science Process Skills and scientific attitudes of undeveloped students require appropriate treatment for students, one of which is to provide learning methods or models that can develop the attitude of Science and Scientific Process Skills. The use of appropriate learning methods or models is the knowledge that must be possessed by the teacher [7], many teachers still use the teacher-centered pattern to pursue a lot of material.

Furthermore, the science process skills with a qualitative descriptive research method that aims to determine the responses of high school students' Science Process Skills in using various learning media about circular motion material. This study uses a population of class X students in one secondary school in Lembang with a sample of 24 people chosen at random. The response of observed science process skills includes observation skills, hypothesizing, measuring, and communicating. Response Science process skills are obtained through the Student Worksheet answers and are processed using percentage interpretation. The results of the research show that through the phenomena developed and directing questions to observe the observed data, it gives an overview that most students can make observations, reveal phenomena based on the data. Based on the results of the data obtained it can be concluded that during the learning process at school with circular motion material the students felt enthusiastic and satisfied with the scientific approach and increased student interest in learning. In addition, the use of instructional media that is applied in schools can improve understanding of concepts, especially circular motion material [8]. Likewise the results of the science process skills of junior high school students in Jambi on the skills of making conclusions, observing, predicting, measuring and classifying are still low [9]. Based on a number of opinions that have been put forward, it can be concluded that with the science process skills students are required to involve mental, intellectual, physical and social skills to build cognitive abilities that ultimately students have integrated knowledge competencies, skills and attitudes that can be applied in everyday life.

Based on the results of a field study in one of the state high schools in the city of Tapaktuan, it is known that the science process skills have not been well trained during the learning process and there has not been a specific assessment of aspects of the science process skills. The assessment conducted by the teacher is still dominant in assessing the results and cognitive abilities of students, the assessment
of aspects of science process skills that are limited and in the assessment during practical activities is very rarely done due to limited infrastructure at school. In order for students to have science process skills, these science process skills must be trained during the learning process. Therefore, related to the importance of mastering the science process skills, in this study the authors formulated the problem namely how is the profile of the science process skills of the students of the City of Tapaktuan on static fluid material?

The purpose of this study was to evaluate the physics process skills profile of high school physics students in the city of Tapaktuan on static fluid material and is expected to be able to describe well the level of students’ science process skills. The problem of this research is how is the profile of science process skills of high school students in Tapak Tuan City. The contribution of this research is to provide information for teachers about students’ science process skills, which can be used to design learning by finding appropriate learning methods and media so that high school students in Tapak Tuan city have good science process skills.

2. Methods
This type of research uses descriptive qualitative research. Qualitative research is research where researchers are placed as key instruments, qualitative research produces and processes data that is descriptive [10]. The rationale for using this method is because this research wants to know the problems that exist in natural conditions. Then the researchers used a qualitative method by describing the data researchers obtained as a study. The study was conducted at one of the high schools in the city of Tapaktuan. The population in this study were all students of grade X MIPA High School in the city of Tapaktuan. The sample in this study were 20 students of Class X MIPA. Data collection techniques used in this study were multiple choice test instruments. Skill test questions based on skill indicators with aspect indicators namely aspects, observation, classification, interpretation, prediction, asking questions, hypothesizing, planning an experiment, applying concepts and communicating [11]. The preparation of the validation instrument at this stage, the preparation consisted of aspects of content suitability, construct, and readability.

After completing the preparation of the Science Process Skills assessment instrument on static fluid, the validity test in this study was carried out using the help of the Microsoft Excel program. The reliability test is carried out to get the level of accuracy of the data collection tools (instruments) used. Data obtained from students’ Science Process Skills results are then analyzed using simple statistical analysis techniques and categorized according to the following table. The results were obtained through analyzing the results of multiple-choice questions about students’ science process skills in developing thinking skills.

Another instrument in obtaining information is the interview sheet to find out the facilities and infrastructure in the school. Furthermore, the data collected will be processed using percentage interpretation data processing techniques. Retrieval of scores obtained is calculated using a formula and converted on a percentage scale (0% - 100%).

\[ x = \frac{R}{SM} \times 100\% \]  

where 
- \( x \) = percentage score for each aspect of science process skills
- \( R \) = scores for every aspect of science process skills
- \( SM \) = maximum score
The percentage values obtained are then categorized according to the following table.

**Table 1. Categories of Students' Science Process Skills**

| Score (%) | Category  |
|-----------|-----------|
| 0 - 25    | Very Low  |
| 25 - 50   | Low       |
| 50 - 75   | Medium    |
| 75 - 100  | High      |

3. **Result and Discussion**

3.1 *Data in the form of Average Science Process Skills*

Data on the Science Process Skills of high school students in the city of Tapaktuan were obtained after students answered a number of Science Process Skills questions that were given individually. Based on the results of the analysis of data about the science process physics skills of high school students in the city of Tapaktuan on static fluid material obtained after students answer a number of science process skill questions given individually. The first analysis is done by counting the number of students' correct answers and classifying students based on the results of the correct answers according to predetermined categories. Based on the results of data analysis, it is obtained that the Physics Science Process Skills of high school students in the city of Tapaktuan are categorized as sufficient and there are some who are lacking. Based on the criteria set out in the Science Process Skills Test, from 20 students obtained mixed results. Judging from the overall science process skills acquired by students, it turns out there are no students in the high category, 6 students have the medium category, and 14 people are in the low category. After obtaining an average of students' science process skills, it was found that the average value of students' science process skills is 48.9 from a maximum score of 100.

3.2 *Data Science Process Student Skills in each Aspect*

The science process skills of high school students in the city of Tapaktuan for each aspect can be seen in table 2.

**Table 2. Data on Average Value of Science Process Skills for each Aspect**

| No | Aspects of Science process skills | Percentage | Category  |
|----|----------------------------------|------------|-----------|
| 1  | observation                      | 62         | Medium    |
| 2  | classifying                      | 65         | Medium    |
| 3  | interpretation                   | 48         | Low       |
| 4  | prediction                       | 54         | Low       |
| 5  | Identifying variables            | 46         | Low       |
| 6  | hypothesis                       | 38         | Low       |
| 7  | Designing experiments            | 40         | Low       |
| 8  | Apply the concept                | 45         | Low       |
| 9  | communicate                      | 42         | Low       |
|    | Total                            | 48.9       | Low       |

3.3 *Discussion*

Based on these tables and figures, it can be seen that from the nine aspects of the Science Process Skills tested in the test questions, there are only 3 aspects that appear with the medium category and the rest are in the low category. The aspects of students' Science Process Skills that appear in the medium category are aspects of observing, classifying, and predicting. While aspects of students' Science Process Skills that appear in the low category are aspects of measuring, interpreting data, identifying variables,
hypothesizing, conducting experiments, concluding, and communicating. This shows that the Science Process Skills of high school students in the city of Tapaktuan for each aspect are generally in the low category, where on average students are only able to answer correctly as much as 48.9% of each aspect of the Science Process Skills of students tested. Based on the above data it can be seen that the students' Science Process Skills are still low which states that the low Science Process Skills of students is caused by many factors, including 1) the low ability of Science Process Skills teachers; 2) lack of teaching materials that develop and enhance students' Science Process Skills; 3) lack of guidance in developing assessment tools based on Science Process Skills both for teachers and for students.

The results of the analysis of students' science process skills for each aspect are described as follows: The observation aspect is the most basic and easiest skill in the Science Process Skill. In general, the aspect of observation has the highest average, reaching 62% with a good category, this good category is said to be the aspect of observation which is the simplest and easiest aspect for each teacher to do in his learning and also where students can relate direct experience with the theory students know. Besides that, by observation students will find it easier to understand the material taught by the teacher so that the ability of student observation is in a good category. Then the classification skills have a higher percentage than the others, because these three abilities have a high percentage compared to others, they are still in the low category. This is because the learning process commonly applied is still a teacher center, and there is no use of media and learning resources that are interesting for students.

The skills of predicting and using tools and materials have a low percentage. This is because the learning process commonly used in these classes rarely provides learning in the form of practicum or observation. The ability to predict must be trained intensively by means of practical learning. Learning by practicum or experiment requires students to carry out scientific stages, one of which is predicting. This skill is also low because learning has not trained students to be happy doing the question and answer process.

Based on the data and discussion above, it can be concluded that the average science process skills of high school students in Tapaktuan City are low (less), 0% are in the high category, 25% are in the medium category, and 75% are included in the low category. This low science process skill is caused by students who have not been trained in science process skills in daily learning. This can be helped by creating a learning environment that facilitates students conducting scientific investigations so that students' science process skills are trained. In choosing the learning model to be one of the factors that will support this. In addition to choosing a learning model, how to train students in special science process skills in experimental experiments.

4. Conclusion
Based on the results of research and discussion of the science process skills profile of high school students in Tapaktuan City, it can be concluded that: the average science process skills of high school students in Tapaktuan City are low (less), 0% are in the high category, 25% are in the medium category, and 75% are in the low category. The achievement of every aspect of skills varies. In the aspects of observation, classification and interpretation of good categories, the aspects of predicting, hypothesizing, selecting variables, conducting experiments and communicating are in the sufficient category, while in the aspects of asking questions, planning experiments and applying concepts are in the less category. The science process skills of high school physics students in Tapaktuan for each aspect of Science Process Skills are still low, with an average percentage of 48.9%.
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