The analysis of students worksheet development using inquiry based learning models with science technology society approach for physics learning of senior high school class XI

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Abstract. Learning Physics aims to develop knowledge and train students' thinking skills. One of the things that can support that is when the teacher in the learning process actively involve learners. But in fact, teachers still dominate the learning activities by providing information directly consequently students be dependent. As we know, student worksheet has printed materials that help students learn independently, actively and creatively. Student worksheet can help students in finding a concept, apply and integrate it. The use of student worksheet is expected to help students in improving their knowledge and skills. The purpose of this study is to determine the analysis of developing student worksheet using inquiry based learning models (IBL) model with science technology society (STS) approach on Physics materials. Respondents selected in this study were students of class XI in SMAN 7 and 5 Padang. Based on these observations, it is seen that the lack of interest of learners in studying physics and the lack of motivation of learners in physics learning. Accordingly to the result for the competence of the attitudes is good. Conversely, it needs an increase for the competence of knowledge and skills needs. The results of the analysis will be the reference for the development of student worksheet using the IBL model with the STS Approach for learning physics class XI.

1. Introduction

Physics is one of the subjects that play an important role in the advancement of science and technology, so physics learning should be carried out is learning that activates students, students' thinking ability, creativity and independence of students to achieve the three competencies (attitudes, knowledge and skills) expected. The fact that happened shows that the participants who were issued by students were still low. Shown from the midterm exam score of the even semester of the 11th grade students of SMAN 7 Padangs, which is still far from the maximum completeness criteria score set. This shows that students don’t understand physics learning well.

Based on observations conducted in two state high schools in Padangs city, namely SMAN 5 and SMAN 7 Padangs, it was seen that learning was still not focused on students. Students are still difficult to form or develop concepts independently based on their experience to find problem solving regarding issues or problems being faced. One factor that causes it is teachers who still do not use a variety of learning models and learning approaches. Learning activities carried out are more likely to use the lecture and discussion methods, this making students passive in learning activities.
One learning model that can cause activeness and creativity of students in solving problems is an Inquiry Based Learning (IBL) model. The IBL model influences students' understanding, the development of knowledge on a topic, students' scientific process skills students' attitudes toward science learning, student motivation in student learning and communication skills [1]. The IBL model is also able to improve students' understanding, process skills and attitudes in learning [2].

The purpose of learning use science technology and society (STS) approaches is as the development of decision-making and problem-solving skills of students in dealing with the social-science problems they encounter. In this learning the teacher tries to develop the ability of students to understand the surrounding activities from a scientific perspective, a reflection on the technological dimension and its relationship in society [3]. In this case students are directed to analyze and solve problems by exploring possible solutions to these problems.

With a combination of the IBL model with the STS approach, students become learning centers that can understand the concepts of science and ideas well in the problem solving process so that learning becomes more meaningful and can improve students' learning competencies. Therefore, the IBL model and the STS approach are very suitable to be delivered using student worksheet teaching materials because one of the student worksheet functions is that it can minimize the role of educators, but more enable students [4].

Physics learning is expected to help students learn independently, actively and creatively, therefore the necessary teaching materials in the form of Student worksheets are used in the core learning activities. However, the interview results show that the use of physics teaching materials in schools is still limited and lacking in use, because students have less motivation in having teaching materials. Teaching materials such as student worksheet are not always used in learning, depending on the material and competence of students. The student worksheet which students have used so far is considered less attractive to use.

The purpose of this research is to describe the results of the analysis of the needs and students for the development of student worksheet using the IBL model and the STS approach to the physics learning of class XI.

2. Method
This research is an early stage research from development research or Research and Development (R & D). This research is also a descriptive study with a qualitative approach. Descriptive research is not intended to test certain hypotheses. Development research is a process and steps to develop a new product or refine an existing product [5]. The subjects of this study were Physics teachers and students of class XI Science at SMAN 7 Padangs and SMAN 5 Padangs. Data collection instruments are questionnaire sheets and interview sheets for needs analysis and student questionnaire for student analysis.

The data analysis technique used is a Likert scale. Likert scale can be used to measure opinions or perceptions of a person or group of people about social events or symptoms. The Likert scale is in the form of a statement whose answer is in the form of an approval scale or rejection of the statement given [6]. The respondent's answer scale which is qualitative is converted into an ordinal scale [7]. The conditions for converting for that statement, 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree. The questionnaire results are obtained by calculating the score given by the respondent.

The category of needs analysis and analysis of the characteristics of students is obtained by calculating the scores obtained from each respondent. The score of each respondent is obtained by the equation:

\[ S_k = \frac{\sum X_i}{X_{\text{max}}} \times 100\% \]  

Where:
- \( S_k \): The score is obtained
- \( X_i \): score of each respondent
- \( X_{\text{max}} \): maximum score from the questionnaire for each indicator
Questionnaire analysis to assess the needs analysis of each indicator using the provisions in Table 1.

**Table 1. Categories of Needs Analysis**

| No | Category     | Value       |
|----|--------------|-------------|
| 1  | Very Good    | 90 < N ≤ 100|
| 2  | Good         | 75 < N ≤ 90 |
| 3  | Less than    | 60 < N ≤ 75 |
| 4  | Very Less    | ≤60         |

(modified from Riduwan [8])

3. Results and Discussion

3.1. The Result of Needs Analysis

In the needs analysis, the researchers carried out three analyzes, namely performance analysis, analysis of Passing Competency Standards and analysis of learning difficulties. In performance analysis will see the identification of the teacher and the completeness of the facilities and infrastructure in the school.

**Figure 1. Performance Analysis Chart**

Based on Figure 1 the result of teacher identification are in a good category with a value of 61.36. This means the teacher has prepared learning tools very well and completely, the teacher has provided feedback and reinforcement during the learning process and has been able to evaluate the learning outcomes of students in accordance with the 2013 Curriculum rules [9].

But in the learning process teachers still rarely use student worksheet teaching materials, teachers only use student worksheet on certain material. The student worksheet used is already the result of its own development but not in accordance with the student worksheet design based on the 2013 curriculum. In the learning process that takes place the teacher is still active as a learning center (teacher center), this happens because the teacher has not used a varied learning model according to the 2013 curriculum.

On the other hand, the result of facilities and infrastructure are in a good category with a value of 68.75. This shows that for the use of laboratories in physics, learning is still very rarely done, even though the practicum tools and materials are quite complete available.

Next, in the passing competence standard analysis will be seen the attitude of the spiritual, social attitudes, knowledge, and skills.

**Figure 2. Passing Competence Standard Analysis Chart**

Figure 2. shows that the spiritual attitudes and social attitudes of students are in a good category. However, for the competency of knowledge and skill competencies, students are still in a good enough category.
The reason for the knowledge competence of students in the good enough category is because students have not been able to find facts related to the material. Students also do not have a conceptual understanding, understanding principles and procedural understanding related to learning material. This can be improved if the teacher uses a varied learning model such as IBL and learning approach that can optimize the learning process in line with Simsek’s opinion [2].

In the skills competency, students are still not skilled in using practicum tools and have not been skilled in practicum activities in the laboratory. This happens because the laboratory is still very rarely used during the learning process and the student worksheet that is used does not have the structure, content, and graphics that can increase students' motivation in practicum activities [4].

Whereas for the analysis of learning difficulties will see the use of student worksheet, learning models and learning approaches used during the learning process.

![Figure 3. Learning Difficulties Analysis Chart](image)

Figure 3. shows that the use of student worksheet, learning models and learning approaches are in a good enough category. Student worksheet which has been used in the learning process has not made it easy for students to understand Physics lessons and in carrying out practical activities. Student worksheet that is available in schools also does not make students active in learning during its use.

Whereas the learning model used is still not in accordance with the 2013 curriculum and still cannot improve the activeness of students during the learning process. The IBL model can make students active by applying concepts that are possible in solving problems [2]. The learning approach used can’t make students find concepts, principles or theories through the learning process. The IBL approach can help students to develop students' thinking skills and try independently to find problem-solving [3].

3.2 The Results of Students Analysis

In the analysis of students, it will be seen how interest, learning motivation, learning style of students towards learning physics. And will see how competencies the attitudes, knowledge, and skills of these students.

![Figure 4. Student Analysis Chart](image)

Figure 4. Shows that one of the indicator analyzed has a percentage less than 60% in the indicator of knowledge. But the other five indicators namely interest, learning motivation, learning style, attitude competencies and skill competencies of students have a good percentage.

This shows that students are interested in participating in physics learning and trying to be actively involved in physics learning. However, students still do not have a strong motivation in finding solutions that are needed in completing tasks or problems given in the learning process. The IBL model influences student motivation in learning and scientific process skills [1].
The reason for the competence of students in a sufficient category is because students find it difficult to understand physical material and have not been able to explain the physics material that they have learned. This happens because students do not have a sourcebook that can help them learn at home. Knowledge competencies of students can be improved if the teacher uses a varied learning model and learning approach that can link physics knowledge to explain phenomena in everyday life.

4. Conclusion
Based on the needs analysis and participants analysis, found that the competencies of students were still low. This is because the use of learning models and learning approaches is still not optimally implemented by the teacher. As well as students who are less motivated to have a textbook. In addition, the structure, content, and graphics of the student worksheet used still need to be considered. Low student competency skills are also caused by laboratories that are rarely used during the learning process. Based on this, it is necessary to develop student worksheet using the IBL model with the STS approach in the second semester of physics class XI.

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