Preliminary analysis of students worksheet development using inquiry based learning models with scientific approach for physics learning of senior high school class X

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Abstract. The implementation of physics learning is expected to increase students' activeness and creativity in building concepts independently. Facts in the field, the implementation of physics learning accompanied by practicum activities have not been carried out optimally. Students worksheet development is carried out in order to improve students' competencies and make students active in learning. The purpose of this study was to describe the results of the initial analysis for the development of students worksheet. The type of research is descriptive research. The instrument used was an interview guide sheet and questionnaires sheet. The research sample was physics teacher and students of class X of Senior High School Padangs. Research data were analyzed with descriptive statistics. The results of the initial analysis are: learning is still teacher-centered, the structure, content, and graphics of the student worksheets used still need to be revised, student worksheets that do not contain models and approaches, the practicum in the laboratory is rarely done, the students lack motivation to have a textbook and students are less active in learning so that the competence of students still low. The results of the analysis will be the reference for the development of student worksheet using the inquiry based learning model with the scientific Approach for learning physics class X.

1. Introduction
Physics as part of science is the study of natural phenomena which are not only as knowledge but more for implementation and its role in human life. That natural phenomenon can be realized. Conversely, physics learning is not only in the form of facts, concepts and principles. The process is carried out by the inquiry process. These hidden steps are carried out by using scientific steps. The process of learning physics and also doing important tasks such as attitudes, knowledge and skills. The reality that occurs in the field shows that the superiority carried out by students is still low. This is done from the odd semester test scores of the tenth grade students of SMAN 2 Padang which are still far from the defined KKM scores. With these things, students have not examined physical material well.

Based on interviews, needs analysis data, and analysis data of students in three public high schools in Padang city, namely SMAN 2, SMAN 3, and SMAN 7. It is very common that the implementation of learning in schools is not optimally optimal. Factors that are the contributing factors are still using the teacher center, the teacher in using the learning model has not varied. More use of lecture and discussion methods, and still lack of motivation for participants to learn physics. Physics learning that is still not done by student centers. Making students still difficult in developing truly independent concepts that are carried out by the scientific discovery process. Students are also less active in
learning. Conversely, the physics learning device itself has been tried and developed by existing teachers. The obstacle is the time in developing learning tools, especially students worksheet, is still lacking and makes the participants more motivated to learn because the students only use the existing handbook in school.

One learning model that can increase the activeness and creativity of students in carrying out the discovery process independently is a model of inquiry based learning (IBL). Learning with the IBL model is learning that involves students in formulating questions that lead to investigation in an effort to build new knowledge and meaning [1]. The IBL model is also able to improve students' understanding, process skills and attitudes in learning [2]. Based on this, the IBL model is expected to improve the aspects of attitudes, knowledge and skills of students.

The learning process in accordance with the 2013 curriculum is using a scientific approach. Its implementation with a scientific approach is a learning process that is designed in such a way that students actively construct concepts, laws or principles through stages of observing, formulating hypotheses, collecting data, analyzing data, and drawing conclusions and communicating [3]. The purpose of learning to use approaches is to provide direct experience to students based on facts and phenomena to develop the ability to think objectively and rationally in daily life.

The combination of the IBL model with a scientific approach makes students as learning centers that can make active, creative to learn independently and enthusiastically in learning the findings directly and can improve students' learning competencies in a balanced manner. Therefore, the IBL model and scientific approach are very suitable to be delivered using students worksheet teaching materials because one of the students worksheet functions is that it can minimize the role of educators, but more enable students [4]. The purpose of this study was to describe the results of interviews, needs analysis and students for the development of students worksheet using the IBL model with a scientific approach to physics learning in class X semester 1.

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. Descriptive research is research that aims to provide or describe a situation or phenomenon that occurs at this time by using scientific procedures to answer actual problems [5]. This phenomenon can be in the form of forms, activities, characteristics, changes, relationships, similarities, and differences between one phenomenon and another. The purpose of this descriptive study is to make a systematic, factual, and accurate description of the facts, and the characteristics of certain regional populations [6].

The population of this study were students of class X MIPA of Senior High School 2, Senior High School 3, and Senior High School 7 Padangs. The number of subjects is calculated with the right proportion or statistical approach in accordance with the applicable rules [7]. The research sample was students of class X MIPA 1 of SMAN 2, X MIPA 6 of SMAN 3, and X MIPA 6 of SMAN 7 Padangs. The data used in this study are primary data obtained through questionnaires. Data collection techniques are questionnaires. Questionnaire is used to analyze teacher's assessment.

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 [8]. The respondent's answer scale which is qualitative is converted into an ordinal scale [9]. The conditions for converting for the 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:

\[ S_k = \frac{\sum x_i}{x_{max}} \times 100\% \]  

(1)
Where:
Sk: score is obtained
Xi: score of each respondent
Xmax: maximum score from the questionnaire for each indicator

Questionnaire analysis to assess the needs analysis and analysis of students in each indicator using the provisions in Table 1.

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

Source: Kemendikbud (2013) [10]

3. Results of Research and Discussion

3.1 Results of Needs Analysis

Need analysis is a process to get information about needs in the learning process so that the development of this students worksheet is needed. This stage includes performance analysis, gradation standard analysis and analysis of learning difficulties. Results of needs analysis in three schools. The results of the performance analysis include teacher identification, the lack of supporting facilities and infrastructure. The results of the performance analysis of the three schools can be seen in Figure 1.

![Figure 1. Graph of Performance Analysis Indicator](image)

Figure 1 shows that teacher identification and facilities and infrastructure are included in the good category. This shows that the teacher has prepared learning tools 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. However, in the learning process teachers still rarely use teaching materials in the form of students worksheet, combine the students worksheet with the learning model, and only carry out practicum for certain basic competencies. The students worksheet used by the teacher is the result of its own development but not in accordance with the students worksheet design based on the 2013 Curriculum.

The learning process that takes place still does not make students active and the teacher is still the center of learning. This happens because the teacher has not used a varied learning model and scientific approach that is in accordance with the 2013 Curriculum. Then, the use of laboratories in physics learning is still very rarely done, even though the practicum tools and materials are sufficiently available.

Graduate competence standard analysis is carried out by looking at the three aspects of competencies that will be achieved by students namely aspects of attitude competency in the form of spiritual attitudes and social attitudes, knowledge and skills. Graduate competence standard analysis
shows the standard of students behaving in accordance with the teachings adopted, active participation in the school and group environment, and good interactions in behavior and speaking. The results of the graduate competence standard analysis can be seen in Figure 2.

Figure 2. Graph of the results of Graduate Competence Standard Analysis

Figure 2 shows that the aspects of the spiritual and social attitudes of the students considered by the teacher are very good which have a much higher value than the aspects of knowledge and skills that have good categories. Knowledge aspects are in the unfavorable category with an average score of 62.50. This indicates that students do not have an understanding of the facts, concepts, principles, and procedures in the learning process. In addition, the skill aspect is in poor criteria with an average percentage of 68.06. This indicates that students have not been able to construct concepts through the discovery process directly so that students are less active in practical activities. Another factor is the lack of practical activities carried out in the laboratory and only on certain material. This makes students still not skilled in using practical tools and practicing. Another factor is the lack of practical activities carried out in the laboratory and only on certain material. This makes students still not skilled in using practical tools and practicing.

Analysis of learning difficulties illustrates the factors that influence the learning process which include the use of students worksheet, learning models and learning approaches. The results of the analysis of learning difficulties can be seen in Figure 3.

Figure 3. Graph of Analysis of Learning Difficulties

Figure 3 shows that the use of students worksheet, learning models, and learning approaches are lacking criteria. The students worksheet used so far has not made active students in carrying out practical activities and the learning approach used by the teacher is also still less able to develop students' thinking abilities. Furthermore, 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 learning approach used cannot yet make students independently find concepts, principles or theories through the discovery process directly during learning and cannot develop students' thinking skills.

3.2 Student Analysis Results

The analysis results of students are seen from several indicators, namely: interest, learning motivation, learning style in physics learning. Conversely, students' competencies will also be seen in the form of
attitudes, knowledge and skills. The results obtained from the analysis of students using the instruments that have been developed are shown in Figure 4.

![Figure 4. Graph of Student Analysis Results](image)

Figure 4. Indicating that indicators of interest, learning motivation, learning style, attitude competencies and skill competencies of students are in good category. However, for knowledge competency indicators are still in the unfavorable category. This shows students have not understood physics material well but 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. Furthermore, the skill aspect of students also has not carried out practicum well, actively, and enthusiastically. Knowledge competencies of students can be increased if the teacher uses a variety of learning models and learning approaches that can construct concepts, principles, and laws through discovery with scientific methods.

Material analysis needs to be done before the development of the students worksheet because it is used as the basis for knowing the material that is relevant to the curriculum's demands. Material analysis will also be related to the selection of learning models and effective approaches, so that learning objectives are as expected. Material analysis is the identification of materials that will be taught and systematically compile them and link one material with relevant material, such as concepts, principles and procedures can be linked to natural phenomena in everyday life. Based on the analysis of the tasks that have been carried out, the assignments given by the teacher are in accordance with the competencies to be achieved, in accordance with the material being studied, in accordance with the learning objectives and can improve the competence of knowledge, attitudes and skills.

The choice of the learning model as the implementation of the scientific approach to learning requires careful analysis in accordance with the characteristics of competencies and learning activities. Selection of learning models can be done by considering the following matters: (1). Characteristics of knowledge that are developed according to factual, conceptual and procedural categories; (2). Characteristics of skills contained in the formulation of basic competencies; and (3). The selection of the model considers the attitude developed, both religious attitudes and social attitudes [11]. Students worksheet is developed to be able to overcome the problem of students who are less motivated in participating in physics learning and reading physics learning resources. Based on the results of the needs analysis and analysis of students, learning resources and learning models are needed that are in accordance with the characteristics of students and schools, namely students worksheet using the IBL model with a scientific approach. The IBL learning model was chosen to be able to foster a sense of curiosity, cooperation and creativity. The application of the scientific approach is a challenge for teachers through developing the activities of students, namely observing, asking, trying, processing, presenting, reasoning, and creating [12]. Using students worksheet using the IBL model with a scientific approach that can make it easier for students to do the practicum and learners better understand the material in the practical process.
4. Conclusion
Based on the results of needs analysis, analysis of students, and material analysis, it was found that physics learning accompanied by practical activities had not been carried out optimally. The factors that influence are: 1) learning is still teacher-centered; 2) the structure, content, and graphics of the student worksheets used still need to be reviewed and revised; 3) the existing student worksheets do not yet contain the steps of the IBL model and scientific approach; 4) lab work is rarely done; 5) lack of motivation of students to have other learning resources such as textbooks; and 6) students are less active in the learning process so that the competencies of students are still in the low criteria. Based on the results of preliminary studies that have been conducted, researchers will students worksheet using the inquiry based learning models with a scientific approach for physics learning of senior high school class x.

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