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## Preliminary analysis to develop student worksheet based on inquiry based learning model for 21<sup>st</sup> century physics learning

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# Preliminary analysis to develop student worksheet based on inquiry based learning model for 21<sup>st</sup> century physics learning

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**Abstract.** One of the efforts to achieve 21<sup>st</sup> century skills in learning of physics, student worksheet with the inquiry based learning model that can improve creative thinking skills. Reality in the field still finds learning in schools that have not achieved one of the 21<sup>st</sup> century skills expected in learning of physics. The aim of this research is to obtain results of the preliminary analysis which became the basis to develop Student Worksheet. Participant of this study were physics teachers and students from several high schools in Padang. Preliminary analysis to develop student worksheet includes Teacher Reform Analysis, Learning Difficulty Analysis and Student Characteristics Analysis by retrieving data obtained through observation sheets and interviews. The data was analyzed using descriptive statistical methods. The result show the student worksheet developing by teacher has not been able to achieve 21st century skills in learning of physics.

## 1. Introduction

Learning is an interaction between teacher, student and learning resources in a learning atmosphere[1]. In a learning activity there are three important components, namely students, pedagogue, and learning resources. At this time, students are required to be able to have 21st century skills. So that these skills can be achieved, the quality of learning is changed to become a student center[2]. The 2013 curriculum is a government effort to achieve 21st century skills that emphasize student center learning through a scientific approach[3]. In the scientific approach students are required to think creatively in accordance with 21st century skills.

An important component in learning is the source of learning. The source of learning is everything that can help students to achieve learning goals<sup>[4]</sup>. Learning resources are broad and can be divided into several parts, one of the most frequently used parts in the form of teaching materials, in this case the student worksheet. Student worksheet is a teaching material designed and is expected student who using it can get the concept individually<sup>[5]</sup>. In order to develop a proper student work sheet, teachers must have qualified knowledge and skills<sup>[6]</sup>. The use of student worksheets as a result of development by teacher expected to be able to achieve the demands of 21st century skills.

The facts in the field show that the use of student worksheets as a result of the development of educators has not been optimal to achieve the demands of 21st century skills so that in-depth research



is needed. In developing student worksheets, in-depth research was carried out in the analysis of teacher reform, student learning difficulties, and student characteristics. The inquiry based learning model is a type with a model that is considered an ideal model. In this model students are asked to design their own experiments so that they are considered as the most difficult model to implement but allow a better understanding of the concept of material especially to stimulate abilities that are in accordance with the demands of 21st century skills. This model consists of 5 phases namely orientation, conceptualization, investigation, conclusion, and discussion [7].

Based on the existing phase, there are 5 benefits to using the IBL model. First, it can attract students' interest in science learning. Second, can improve students' understanding of concepts. Third, it leads to an understanding of the nature of scientific knowledge. Fourth, facilitate collaboration between students. Fifth, help develop students' experimental skills [8]. This shows that the use of the ideal IBL model is used as a development base to fulfill the skills of 21st century students.

## 2. Research Methods

This research is a descriptive study with qualitative methods conducted in the range of May to June 2019. The results of the research data were obtained through instruments in the form of observation and interview questionnaires for analysis of teacher performance and analysis of learning difficulties, then analysis of student characteristics was obtained from observation questionnaires. The research sample was educators and students from SMA 4 and SMA 6 Padang. The data obtained is qualitative data. The results of the analysis obtained are expressed in the form of scientific narratives.

Plomp development model is the choice of the model used in this research. This model has 3 phases, namely preliminary research, development or prototyping, and assessment phase [9]. The basis for formulating indicators uses the method of developing the Plomp model. At the preliminary research phases, an analysis of the problem is carried out and a look at the literature. Then made a prototype that will be tested and revised based on formative evaluation. Finally, an assessment of the usefulness of the product is carried out and then it is applied to learning. But in this study only the preliminary stage was used.

## 3. Result and Discussion

The research instruments in the form of observation questionnaires and interviews consisted of several indicators. The results of the analysis obtained from the research instrument correspond to first phases of the plomp model, preliminary research. At the phase the important activities are the Teacher Reform, Learning Difficulty and Student Characteristics Analysis.

Teacher Reform Analysis has several subindicators, namely teacher identification and complete infrastructure, Learning Difficulty Analysis consists of several subindicators, namely student worksheet, learning model and learning approach. Subindicator for Student Characteristics Analysis in the form of Interest, Motivation, Learning Style, Attitude, Knowledge and Skills.

### 3.1. Teacher Reform Analysis

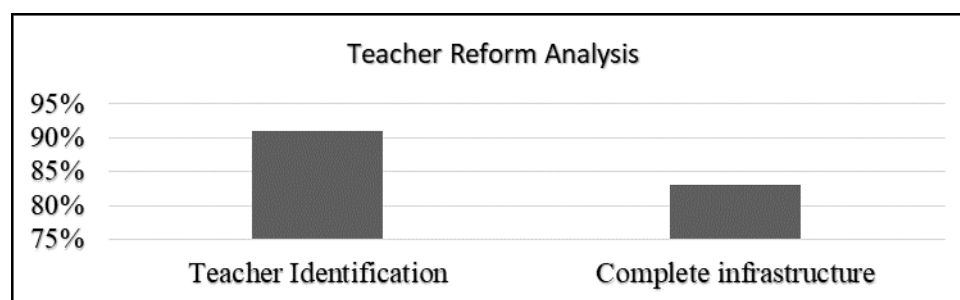
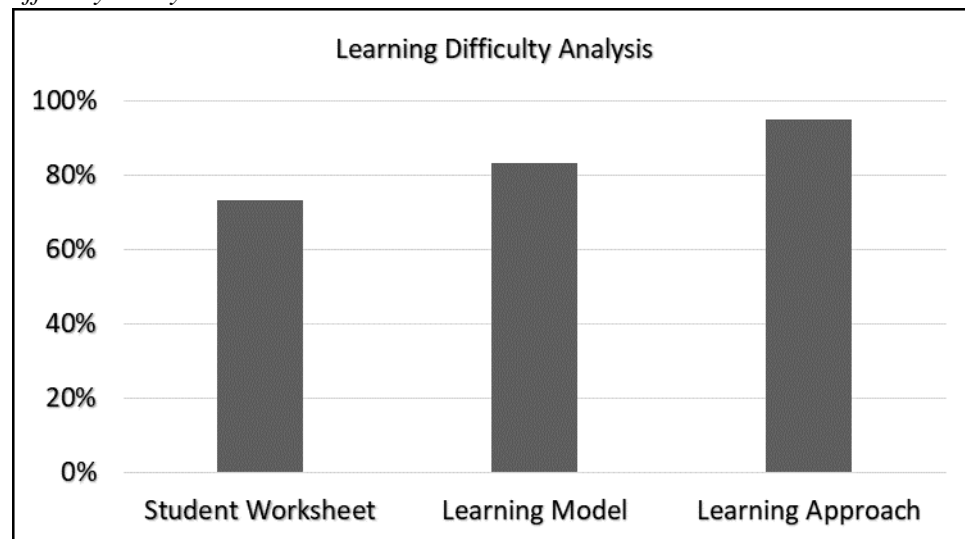


Figure 1. Teacher Reform Analysis

It can be seen from Figure 1 that Teacher Identification has reached 91% while Complete Infrastructure has reached 83%. This means that Teacher Reform Analysis can be said to be quite good, but for better results, there needs to be an increase in efforts to achieve satisfactory results.

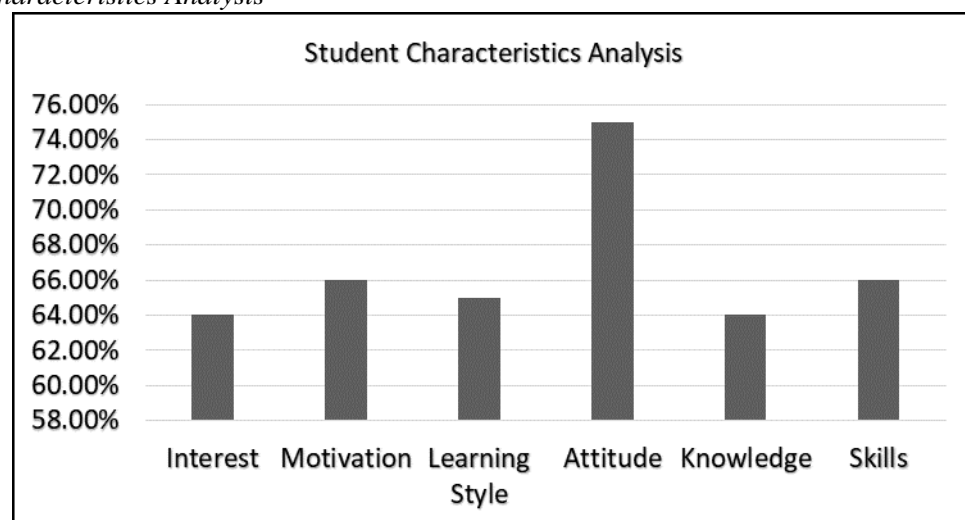
### 3.2. Learning Difficulty Analysis



**Figure 2.** Learning Difficulty Analysis

Based on Figure 2, Learning Difficulty Analysis shows that the Student Worksheet reaches 73%, Learning Model reaches 83%, and Learning Approach reaches 95%. In this case it appears that the use student worksheet still needs to be developed so that a deficiency of 28% can be reduced to a minimum.

### 3.3. Student Characteristics Analysis



**Figure 3.** Student Characteristics Analysis

Based on Figure 3, there is a 64% Interest, 66% Motivation, 65% Learning Style, Attitude 75%, Knowledge 64% and Skills 66%. Based on the data shows that Student Characteristics Analysis as a whole is still in a stage that really needs development, so that 21st Century Physics Learning can be achieved.

#### 4. Conclusion

Form the results all figure it is known that the Teacher Reform Analysis, it is good that means there are no problems with the teacher, only in the Learning Difficulty Analysis and Student Characteristics Analysis, there is a need for improvement, especially in the Student Worksheet, therefore preliminary analysis is needed to develop student worksheet based on IBL model to achieve the demands of 21st century learning.

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