Preliminary Analysis of the Development of Science Module with Research Based Learning Model for Junior High School

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Abstract: *The research on the development of science modules is based on the Research Based Learning model in science object material and its observations to improve students' problem solving skills using 4D models. The steps of this development model are Defined, Design, Develop and Disseminate. The analysis carried out in the Define stage is curriculum analysis, material analysis and analysis of students. The research conducted included a type of qualitative descriptive research. For each item statement provided, 4 (four) alternative answers. Based on the analysis that has been done, it can be stated the results of the research, namely the application of the curriculum conducted by teachers in the class is not in accordance with the demands of the existing curriculum, namely the 2013 curriculum, must be able to develop the research and observation capabilities of students. This research is conducted at Junior High School (SMPN) 1 Danau Kembar, Solok Regency, West Sumatra, Indonesia. The results of the analysis of students obtained data that the indicators of interest and motivation of students were in the poor category. So that it is recommended to develop a junior high school science module with a Research Based Learning model to improve problem solving skills in science object material and his observations.*
Keywords*: Preliminary Analysis, IPA Learning Module, Research Based Learning Model.*

I.   Introduction

Education aims to improve the quality of human resources in order to be able to compete in facing any changes that occur globally. Through humane education it is expected to be able to develop their potential in an effort towards a better direction. Education is the most important pillar that is expected to bring about a change in a nation. Improving the quality of education must be done to develop competencies and form thinking patterns in order to educate the life of the nation.

Science (IPA) can affect the development of human quality. Science is built on scientific products, scientific processes, and scientific attitudes. In addition, IPA is seen as a process, product and procedure. Learning science at school is useful for students to get to know themselves and their surroundings. Science Education emphasizes on providing direct experience and practical activities to develop students' competencies in order to be able to explore and understand the natural environment scientifically.

The government continues to strive to develop a national education system. The development of the national education system also includes science subjects to create quality human resources. Various efforts have been made by the government, including the improvement of the curriculum which is now the curriculum of 2013 revision, provision of facilities and infrastructure, building construction and provision of science laboratory equipment, complete facilities and infrastructure for school libraries, and provide opportunities for educators (teachers) to carry out research in education to creating quality human resources.

Many educational experts have conducted research in various fields of education. Research conducted by these experts aims to improve the quality of education. Preliminary study of the implementation of the 2013 curriculum in integrating the scientific approach through inquiry and authentic assessment models in science learning in the city of Padang [1]. Research entitled the application of the "Research Based Learning (RBL)" learning model to increase the activity and mastery of the concept of life skill-oriented students in the thermodynamics course majoring in Natural Sciences FMIPA Universitas Negeri Padang, Indonesia [2]. Research on the development of worksheets in research-based physics learning at Senior High School (SMAN 1) Padang obtained good results in improving students' knowledge, attitudes and skills. However, these efforts have not helped much to overcome the problems in the class [3].

Science subjects are a means to awaken the object of education. The object of education is students to recognize the beauty and regularity of nature in order to increase confidence in God, cultivate a scientific attitude, provide an experience to be able to test hypotheses through experiments, and communicate the results

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of experiments in writing and verbally. The purpose of science learning is to expect students to be able to show activities in supporting a good learning process, and the expected results are achieved. Ideally science learning is the achievement of science learning goals based on core competency indicators and basic competencies.

Science learning can bring students' curiosity to the symptoms of nature in the environment. The role and concern of educators on the environment are very important as an example of students in everyday life. Through science learning students can gain direct experience, so that they can add strength to receive, store, and apply the concepts they learn. Science learning requires teaching materials to achieve learning goals. The role of the teacher is expected to be able to understand the demands of the curriculum well, so that they can design and implement learning.

The results of the observations obtained turned out that the learning outcomes of students had not reached the minimum completeness criteria (KKM). In addition, the reality in the field is also found to be a gap between the objectives of national education and student learning outcomes. This can be seen from the competency of knowledge of students in Table 1..

Table 1. Result of IPA exam for students of SMPN 1 Danau Kembar school year 2017/2018.

No	Class	KKM	% Pass	% Not Pass	Total of Students
1	VII.A	70	63.3	36.7	30
2	VII.B	70	53.3	46.7	30
3	VII.C	70	57.1	42.9	28

Table 1 explains the achievement of student learning outcomes in the science object material and his observations. In Table 1, it can be seen that there are still many students who have not finished completing science materials, especially the science object material and their observations. This is due to the lack of understanding of students about the material.

Students should have positive attitudes and show them in daily life as a form of attitude in carrying out experiments, reporting on the results of experiments and discussing. Students are also expected to be able to understand, process, reason, present and analyze knowledge about phenomena, especially about the material of scientific objects and their observations and apply them to solve problems independently by using scientific methods. This is not yet done well at SMPN 1 Danau Kembar, Solok Regency, West Sumatra.

The 2013 curriculum implementation requires students to be able to work actively, creatively and independently. In addition, in the 2013 curriculum, students are directed to be able to learn with scientific steps. The desired scientific step in the 2013 curriculum is starting from observing, asking, trying / collecting data, associating/reasoning and communicating [4]. In order for the results of the learning to be carried out in accordance with the demands of the 2013 curriculum, a teaching material in the form of a module that is good and in accordance with the needs of students is needed.

A Module is a teaching material that is composed of components that are designed in a planned and systematic way using simple language to help students achieve instructional goals. Learning using modules have great benefits to improve students' knowledge in terms of their cognitive, affective and psychomotor. Therefore, teachers are expected to have the ability to develop modules that are arranged systematically and planned, this important meaning needs to be elaborated through an explanation of the functions, objectives, and benefits of using the module in learning. So that the science module used is more useful and can improve students' problem-solving skills, then the contents of the module must follow the steps of a learning model. A good learning model used to improve the research capabilities of students is research-based learning.

The Research Based Learning model is a learning model based on research (research) as a step in implementing the process [5]. This means that the learning process that takes place is the implementation of a combination of characteristics of research actions and meaningful learning. In the implementation of Research Based Learning students are expected to play an active role in the learning process so that learning becomes more meaningful. Research based learning can make students remember lessons longer. Based on the description above, it is necessary to conduct a preliminary analysis to develop the science module using the Research Based Learning model of the science object material and its observations.

II.   Method

The type of research used is descriptive-qualitative. Descriptive research is a type of research that describes a variable, symptom, or event as it is without giving a control to the treatment [6]. This study uses a qualitative approach with the consideration that researchers want to see, review, and describe things as they are by understanding the meaning, social interaction, and feelings of a person based on views from data sources rather than researchers [7]. The steps of this research are: analyzing, preparing instruments, conducting testing, and analyzing test results data to obtain the final results.

This research was conducted at SMP 1 Danau Kembar, Solok Regency, West Sumatra, Indonesia. Respondents in this study were students of class VII.C, each of 29 people. The object of this research is the competency of knowledge, attitudes and skills of students. The research instrument used in this study was using a questionnaire. Data analysis techniques carried out in the form of scoring using ordinal scales [8]. Analysis of students is seen from aspects of attitudes, interests, motivation, learning styles and initial abilities. This questionnaire consists of 5 ranges of options using ordinal scales, namely (1) strongly disagree (STS), (2) disagree (TS), (3) agree (S). (4) Strongly Agree.

The front-end analysis category and analysis of students is obtained by calculating the scores obtained from each respondent. The scores of each respondent were obtained using equations (1) [9]:

$$S_k = \frac{\Sigma X_i}{X_{max}} \; x \; 100 \tag{1}$$

Where,

S_k : score obtained.

X_i : score of each respondent.

X_{max} : maximum score from the questionnaire for each indicator.

Data analysis to assess the front-end analysis of each indicator using the category in Table 2.

Table 2. Categories of front and Analysis [9].

Interval (%)	Category
0 – 20	Bad
21 – 40	Less
41 – 60	enough
61 – 80	Good
81 – 100	Very Good

III. Results and Discussion

Curriculum analysis is an initial process that aims to find out and examine the extent to which the curriculum is implemented at school. In this section an analysis of four curriculum elements, namely, Graduation Competency Standards, Process Standards, Standard Content and Assessment Standards. The results of these elements are as follows.

III.1 Results of Analysis of Graduates' Competency Standards (SKL)

SKL analysis was compiled based on Permendikbud No. 54, 2013 [10] concerning the competencies of junior high school students, namely having attitudes, knowledge and skills. Based on the results of field data analysis, it is known that students have good attitudes, knowledge and skills. But in the knowledge dimension, the percentage obtained is still lower when compared to the dimensions of attitude and skill. The results of the analysis can be seen in Table 3.

Table 3. Result SKL Of Analysis

Dimension	Presentation (%)
Attitude	72.2
Knowledge	65.0
Skill	70.0

In Table 3, it can be seen that the dimensions of students' knowledge get a percentage of 65%, while the dimensions of attitudes and skills get a higher percentage of 72.2% and 70%. The low percentage of knowledge is due to students mastering conceptual knowledge. This can be seen from the low ability of students to explain the effects and causes of the phenomena that are around them. Students are still having difficulty connecting what they learned everyday phenomena, although they have understood the concept of the phenomenon theoretically.

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III.2 Results of Content Standard Analysis

Analysis of content standards refers to Permendikbud No. 64, 2013 [11]. Based on Government Regulation Number 32 of 2013 concerning changes to government regulation number 19 concerning national education standards it is stipulated that content standards are criteria regarding material scope and competency level to achieve graduate competency at the level and certain types of education. Components of contents and curriculum consist of Core Competencies (KI), Basic Competencies (KD), and subject matter. Core competencies are competencies in aspects of attitudes, knowledge and skills that students must learn. While Basic Competence is a competency that students must learn about subjects.

In this study, module development was carried out on science object material and his observations in class VII of junior high school. This material consists of four meetings, namely meeting -1: observation of scientific objects, meeting-2: measurement, meeting-3: principal amount, and meeting-4: magnitude of the derivative. The material is compiled based on predetermined Core Competencies and Basic Competencies. Core competencies are designed in four interrelated groups which are related to spiritual attitudes, social attitudes, knowledge, and impartiality. The four groups are the reference in the preparation of Basic Competencies, because the Basic Competencies for each class are derived from Core Competencies.

Based on the results of the analysis in the field, it is known that the planning and implementation of the learning process at SMPN 1 Danau Kembar has been running quite well, with a percentage above 60%. The description of the results of the analysis is shown in Fig. 1.
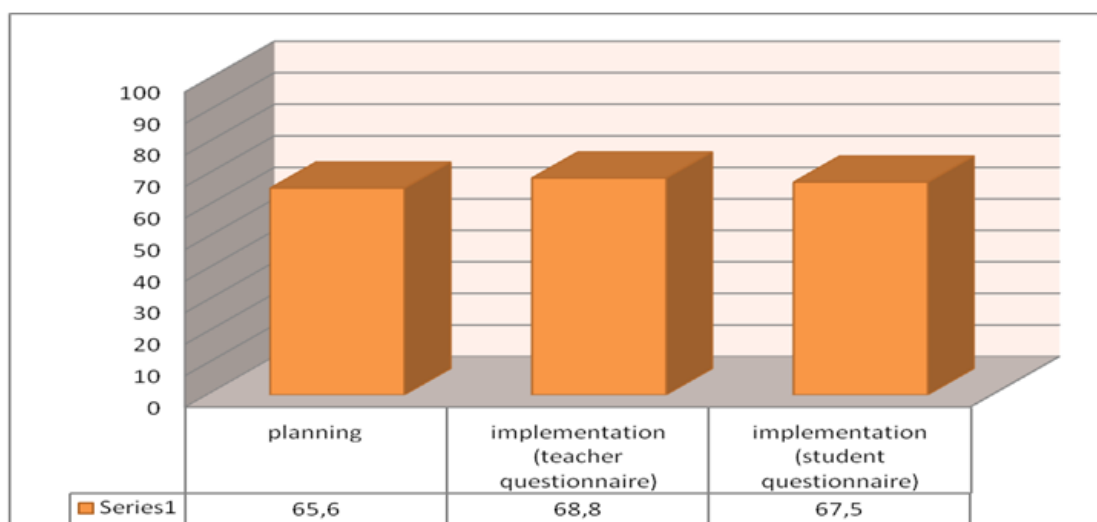

Figure 1. The results of a standard analysis of the learning process at SMPN 1 Danau Kembar

Based on Fig. 1, it can be seen that the planning of the learning process at SMPN 1 Danau Kembar has gone well with a percentage of 65.6%, meaning that the teacher has designed the learning process by preparing the lesson plan in accordance with predetermined components and preparing other learning devices as well. However, the draft Learning Implementation Plan (RPP) still does not meet the principles of RPP preparation.

The observation shows that the preparation of lesson plans still does not pay attention to individual differences in students, the learning objectives are still not specific and learning activities still do not utilize information communication technology (ICT) in accordance with the demands of the 2013 curriculum. In addition, teaching materials used are still not developed according to the characteristics of students not able to stimulate thinking activities and encourage students to develop all the potential they have.

In line with that, the results of the analysis of the implementation of the learning process show a percentage that is not much different from the results of the analysis of the planning stage. The results of the austere analysis of teachers and students on the implementation of the learning process were 68.8% and 67.5% respectively. Based on the results of the analysis it can be seen that the implementation of learning activities has been carried out in accordance with the RPP as well as applying learning processes that are centered on students. The teacher also uses learning media and the application of scientific approaches during the learning process.

However, the application of the scientific approach is still not optimal, because the teacher has not implemented a learning model to strengthen and optimize the learning experience of the approach. In addition, procedural material that requires the existence of experimental activities and observations by students is not done by the teacher, so that the ability of students to carry out research activities in finding a formula for the problem is not achieved.

So that, the learning process can optimize the entire learning experience, it needs to be directed by the application of learning models, namely by applying research-based learning models. Through the research-based learning model, students are encouraged to make observations and investigations in order to find solutions to solve a problem.

III.3 Results of Standard Assessment Analysis

Assessment is the process of gathering and processing information to measure student learning outcomes. Standard assessment analysis is carried out by Permendikbud No. 66, 2013 [12]. Assessment of student learning outcomes includes competency attitudes, knowledge and skills that are carried out in a balanced

manner using techniques that match the characteristics of each competency. Based on the results of observations, it can be seen that, in general, the assessment process at SMPN 1 Danau Kembar has gone well. The description of the results of the analysis can be seen in Fig. 2.
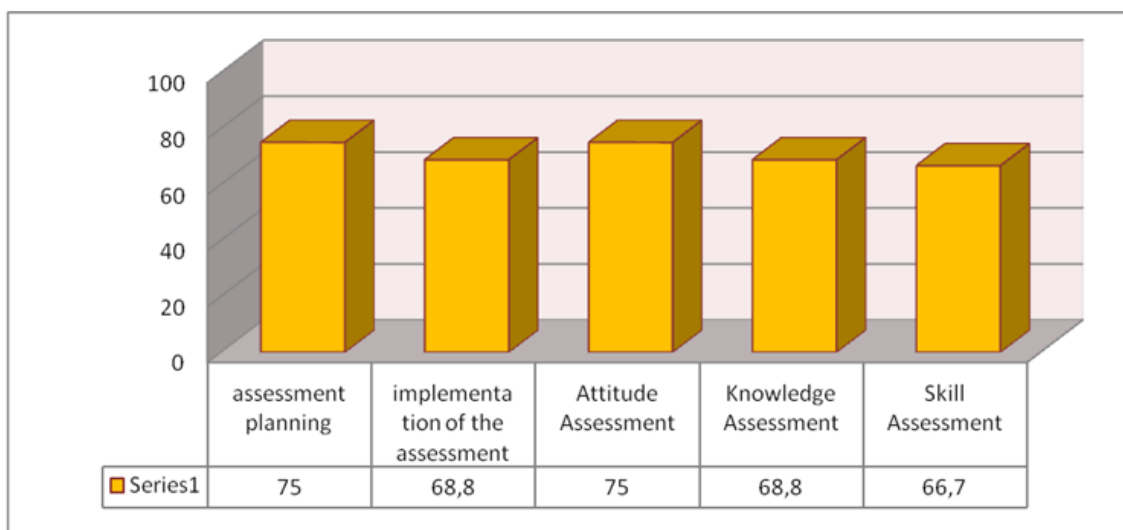

Figure 2. Results of standard assessment analysis at SMPN 1 Danau Kembar

From Fig. 2, it can be seen that the planning of the assessment process at SMPN 1 Danau Kembar has gone well with a percentage of 75%. The teacher has compiled an assessment instrument along with the rubric well, as well as conducting assessment techniques in accordance with the competencies to be measured. However, the arranged rubric is still unclear. Indicators of attitudes and skills that are made are still general in nature, in addition to the competency assessment of attitudes, knowledge and skills are also still not balanced. This is in line with the percentage of assessments for each competency that has not reached 70%. Assessment is still dominated by knowledge competencies through written tests using questions, but the written test questions compiled are still incomplete.
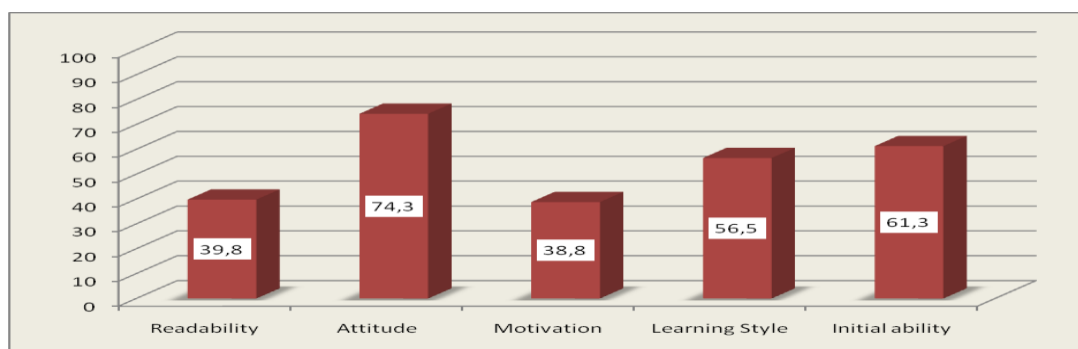

Figure 3. Graph of Characteristics Analysis of Students

The results of the analysis of students in detail can be seen in Fig. 3. Based on Fig. 3, it is known that the analysis of the indicators of interest and motivation of students was obtained by an average of 39.8% and 38.8% in the poor category. This is because students experience difficulties in learning science because teaching materials used have not directed students to find facts that occur in everyday life, meaning that students do not yet know the relationship between lessons in school and applications in everyday life. In school students also rarely do practicum, even though by practicing students feel happy to learn. Indicators of interest and motivation have a very large influence on other indicators such as attitudes, learning styles, and initial abilities of students.

If students have been motivated to learn, students feel interested in repeating lessons at home. And prepare for the next lesson. Therefore, teaching materials are needed that are able to arouse students' knowledge of applications in everyday life, namely the learning module. So that students know the application of learning in everyday life. Through teaching materials in the form of modules, it is expected to support learning so that all problems can be addressed properly. In addition, the results of the analysis of students on scientific abilities can be seen in Fig. 4.
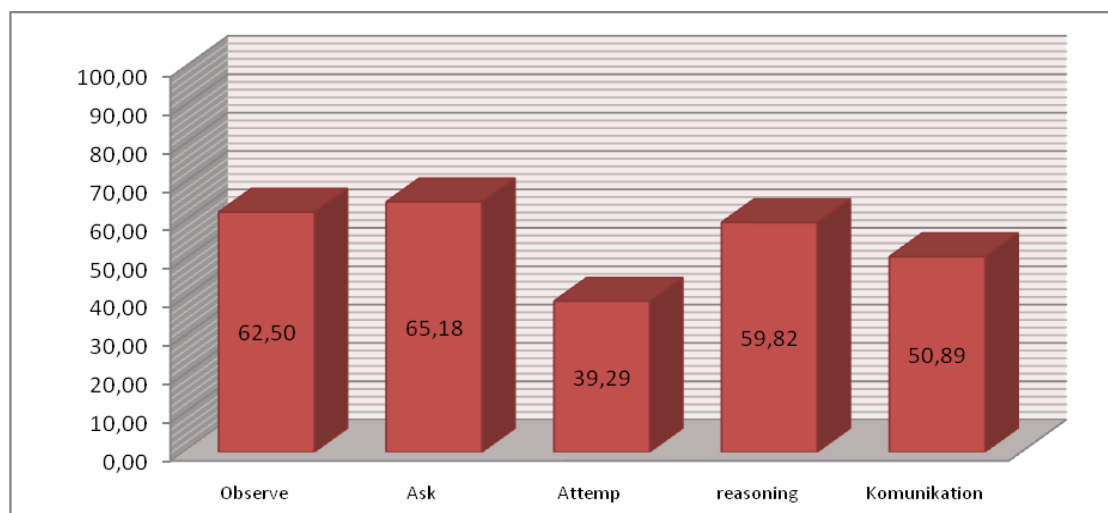
Figure 4. Results of analysis of the characteristics of students.

Figure 4 presents information about the ability of students in the learning process with a scientific approach. From the picture it can be seen that, the trying activities in the process of data collection are in the less good category, that is, with an average percentage of 39.29. This proves that the ability of students to present data from the results of research, experiments and observations has not been able to make a conclusion of an activity. In the case of the 2013 curriculum study based on the scientific approach the experimental results are a follow-up to get conclusions and communicate to others [4].

IV.   Conclusion

It can be concluded that the implementation of learning in schools is not in accordance with the applicable curriculum. The characteristics of the students, both on the indicators of interest and motivation and teaching material, have not been described in accordance with facts, concepts, principles and procedures. Therefore, it is necessary to conduct a preliminary analysis of the development of modules with the Research Based Learning model on science object material and its observations to improve the problem-solving skills of students..

Acknowledgement

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