

# The Implementation of Scientific Approach with Project Based Learning Model to Improve Students' Analytical Skill and Responds

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**Abstract**— *Scientific Approach used in the teaching and learning activities, has become one of the ways that is regulated by the government to improve the students' analytical skills. The Scientific Approach includes "5M" activities namely observing, questioning, experimenting, associating, and communicating. In implementing this approach in Indonesia, the teachers only use two kinds of books: teacher's and student's book; as a reference in the process of learning. One of the learning methods with the scientific characteristics is the Project Based Learning. Project Based Learning is a learning method that uses problems, as the first step to collect and integrate new knowledge, which is based on the real-life experience. The purpose of this research is to improve the students' analytic skill and responsiveness with the application of Scientific Approach-based learning using Project Based Learning Model. In the development of Scientific Approach-based resources with Project Based Learning model to improve the students' analytic skill, it was found that the average point of 3 validators for the lesson plan (RPP) was 4.66%, for the students' worksheet (LKDP) was 4.6% and for the achievement test (THB) was 4.66%; which have met the criteria of valid. Moreover, from the students' responds of the questionnaire, it was found that an average of 73.86% of the students stated that they liked the teaching and learning processes.*

**Keywords**— **Scientific approach, project based learning, analytic skill, students' response**

## I. INTRODUCTION

The development of the era demands an effort to improve the quality of education. This is in line with the continuous development of the educational curriculum in Indonesia. The Ministry of Education and Culture of Indonesia or *Kemendikbud* (2013: 80) stated that the curriculum is an educational instrument to bring Indonesians to possess attitude, knowledge, and skills to be productive, creative, innovative and affective [1]. To

realize this educational objective, the Ministry of National Education or *Depdiknas* undertakes the development and improvement of the curriculum. The curriculum development guide which is developed by the National Education Standards Agency or BSNP has a goal of providing opportunities for learners to learn to build and find their identities through an active, creative, effective and an enjoyable learning process. The curriculum is used as the motive and plan, while the implementation is employed in the process of the teaching and learning activities.

In Indonesia, students' analytical skills in understanding mathematics are very low. Anderson & Krathwohl (2010) states that the student' analytical skill is the ability of student to decipher information into smaller elements to determine the interrelationships between elements [2]. To address the problems that arise in the fields of mathematics subject, there is a need of a learning approach that can improve student's analytical skill. Scientific Approach is one approach used in learning which emphasis the use of scientific methods. The learning approach in the implementation of the 2013 curriculum is expected to be directed so that the students are able to not only solving the problems (by answering) but also formulating problems (by questioning). In teaching and learning activity, scientific approach includes some steps to be followed: observing, questioning, experimenting, associating, and communicating. According to Hosnan (2014: 34), regarding the scientific learning, "the implementation of 2013 Curriculum with scientific approach is a learning process designed in such a way that learners can actively construct the concepts, laws, or principles through observing stages (to identify or find problems), formulate problems, propose or formulate hypotheses, collect data with various techniques, analyze data, draw conclusions and communicate concepts, laws or principles found "[3] [4].

One of the learning that has scientific approach characteristics is Project Based Learning. Project Based Learning (PBL) is very important to improve the quality of the student activities. It contains several different learning processes [5] [6]. One of the learning subjects related to the real-life experience is the Statistics subject. Statistics is one subject in Mathematics that must be given to the junior high school / MTs students. Statistics material itself is studied by students from elementary school Grade 6 which will be further deepened in junior high school / MTs level. However, many constraints felt by teachers in teaching statistical materials such as presenting data in a pie-chart, including the mean, median and mode of the data, and teaching statistical materials to the students. An alternative approach that can be used in statistics subject is the Scientific Approach, while the learning model that can be used is Project Based Learning. Using scientific approach and PBL, the statistical material will be presented based on the problems close to the learner which require them to use their experience to solve the problem.

Based on a research (Yulistiyana, pradita: 2015), after the implementation of project based learning that aimed to improve student achievement and creativity on the colloidal system subject, at Science Class XI in the even semester of Junior High School in Klaten, the students' mastery could reach 38,09% in cycle I and 76,19% in cycle II. Meanwhile, when viewed from the affective aspects of the students, the affective achievement is 78.31%. The application of learning model of Project Based Learning on colloidal system can also improve the students' creativity; students with high creativity is as much as 57,14% in cycle I and 66,67% in cycle II.

The purpose of this study is to improve the students' analysis and responsiveness in the application of Scientific Approach-based learning with Project Based Learning Model on seventh graders at class A, SMPN 1 Ambulu.

## II. METHOD

This study is the research and development using Plomp development model. There are 5 phases in Plomp (2010) development model: (1) Initial Investigation, (2) Design, (3) Realization / Construction, (4) Test Phase, Evaluation, and Revision, (5) Implementation Phase. The reason of the researchers use Plomp model is due to the systematic sequence of the activities that is easy to be applied and understood. The population included in this study were students of Class VII A (Academic Year of 2017/2018), SMPN 1 Ambulu. They were in their even Semester. The class consisted of 30 students: 11 male students and 19 female students.

In this study, the researchers used the observation sheet guideline. The observation was a direct observation which

was done directly with the researchers as the observer of the teaching and learning activity. In this observation the authors used the student work sheets (LKPD), the result of the achievement test (THB) and the responses of the questionnaire of the students to the application of Scientific-based learning Approach with Project Based Learning Model. In addition to the author, this observation is also assisted by two observers who have mathematics education background.

The data of the student analytical skill was obtained from the achievement test result on the fifth phase. To know the student's response to the application of Scientific Approach-based learning with Project Based Learning Model, each student was given a questionnaire to be filled. According to Komalasari (2011: 81) questionnaire contains three parts: the title, introduction containing a purpose of the questionnaire, or a guideline to fill in the questionnaires, and the items of questions containing opinions and facts [ 7].

## III. FINDINGS

The teaching and learning resources that have been developed are the lesson plan (RPP), students' worksheet (LKPD) and the achievement test (THB) that have been validated by the validators and met the valid criteria. Presented in Figure 1.

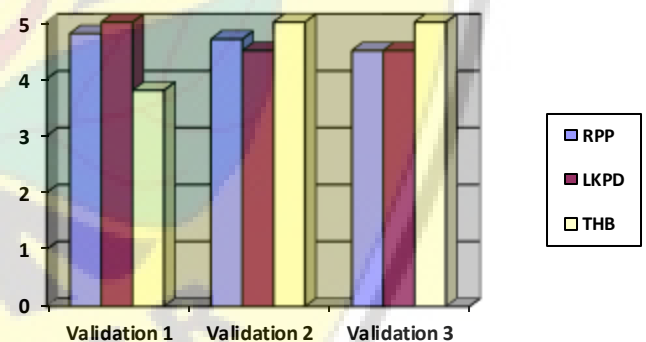


Fig.1: The validation result of the learning resources

From the validation results, the researcher conducted the research at Class VII A of SMPN 1 Ambulu; academic year of 2017/2018 in the even semester. The study consists of 5 cycles.

In the first cycle, the researchers employed lecturing method without the scientific approach. This is done to determine the student's response to the teaching and learning process in class. From the first cycle, it was found that there were 11 out of 30 students who were active in class. From the first cycle, it can be concluded that the lecturing method was less desirable by the students.

After the first cycle, the second cycle of this study used the Scientific Approach-based learning with Project Based Learning Model. The teachers distributed student work sheet (LKPD) to each group that had been formed for discussion. The student worksheet (LKPD) included the 5M stages of scientific approach (observing, questioning, experimenting, associating, and communicating). In the second cycle, the students were active and enthusiastic in following the teaching and learning activities. It was due to the activities which each group member presented the results of their discussion in front of the class; while other groups commented the result of the discussion. For the third and fourth cycles, the researchers used the student work sheets (LKPD) that included Scientific Approach-based learning with the Project Based Learning Model.

The students' analytic ability was obtained from the students' ability to answer the achievement test (THB) in the fifth cycle. The test consisted of 3 questions; each question has different difficulty level. The first and second questions contained moderate analytical skill questions with 30 score each, while the third contained a difficult analytic problem with a score of 40. This can be seen clearly seen at Figure 2.

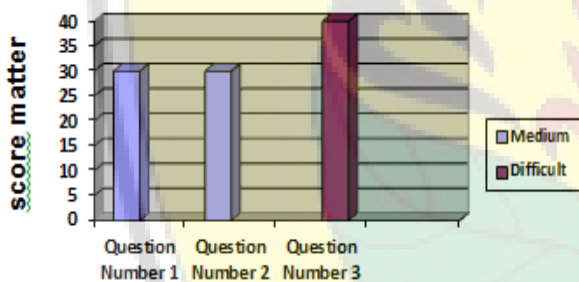


Fig.2: The category of the achievement test (THB)

In the First Cycle of the achievement test, the result showed that there were 10 students from 30 students who scored above the *KKM* or the minimum score to be obtained. On the other hand, there were 20 students scored below the minimum score criterion or *KKM*. The minimum score for mathematics subject is 70 in this school. The result of this cycle is due to the use of lecturing method without loading Scientific Approach or Project Based Project Learning.

In the fifth cycle, the test result from 30 students showed that there were 17 students who had score above the *KKM*, and 13 students who got the score under the *KKM* or the minimum criterion of the score obtained. The overall average of the succeed-students was 56.7% while the average of students who failed was 43.3%. This result was due to the implementation of Scientific Approach using Project Based Learning.

Regarding the results of the achievement test on the fifth cycle, it can be concluded that the ability of the students to analyze the problem had increased. From the result, we could see that a total of 17 students scored above the minimum criteria compared to the 13 students who scored below the minimum criteria because they were less able to understand each question on the test of learning outcomes.

In each cycle, the researchers also distributed a questionnaire to the students to determine the response of learners on learning activities. In the first cycle, it was found that the students were less attracted to the teaching and learning activity due to the lecturing method. On the other hand, the students engaged in the teaching and learning actively because the researchers have applied Scientific Approach-based learning using Project based Learning model. The students' responses can be seen in Table 1.

Table.1: Students Questionnaire on the Teaching and Learning activities with Scientific Approach Using Project Based Learning model

No.	Aspect	Questions to be responded
1.	Aspect 1	Do you like to follow the teaching and learning process which is based on scientific approach?
2.	Aspect 2	Do you find the learning process, teaching technique, classroom atmosphere, and sitting arrangement desirable?
3.	Aspect 3	Do you think that learning with the worksheet or <i>LKPD</i> , as well as stating and expressing ideas or opinion is desirable?
4.	Aspect 4	Do you have sufficient time to have a discussion in solving the problems and expressing your ideas?
5.	Aspect 5	Do you like to have other subjects of the study to employ scientific approach with project based learning model?
6.	Aspect 6	Can you comprehend the language features used in the worksheet?

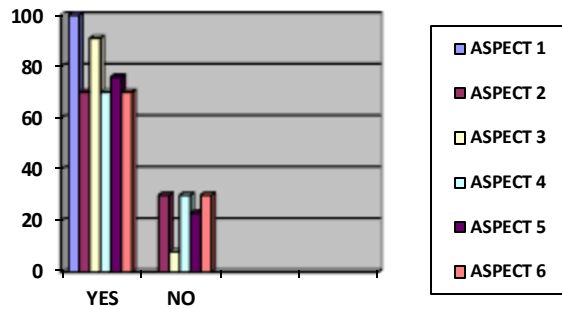


Fig.3: The result of the Student Questionnaire

Figure 3 shows that the students' responses on the questionnaire towards the implementation of the model to improve their analytical skills were very good. From the result of the questionnaire, it can be concluded that there were 73.86% students who liked the implementation of the approach, while there were 26.1% students who disliked the implementation in the teaching and learning activity.

#### IV. CONCLUSION

The application of scientific approach using project based learning model was able to improve the students' analysis ability in understanding every problem on the achievement test. It was also found that the students' responses from the questionnaire result were very positive. Firstly, it can be seen from the total of 56,7% students who passed the test and 43,3% of students who did not pass. Secondly, the positive responses of the teaching and learning activity were as much as 73.86%, while the negative responses were only 26.1%.

#### V. SUGGESTION

The implementation of scientific approach using project based learning model should be applied to other subject matters. Using this method, it can not only improve the students' analytic skill, but also improve the students' responses in the teaching and learning activities.

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