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LEARNING BASED ON SCIENTIFIC APPROACH ASSISTED BY TEXTBOOK OF "AKU DAN FISIKA" IN DYNAMIC ROTATION AND BALANCED MATERIAL TO IMPROVE LEARNING OUTCOMES

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Abstract

This study is aimed to describe the average learning outcomes of using scientific approach assisted by "Aku dan Fisika" textbook is better than learning by lecture method. The learning outcomes of XI MIA students of SMA Muhammadiyah 2 Surabaya can be increased after applying *scientific approach* learning assisted by textbook "Aku dan Fisika". *True experimental design* isused in this study. One experimental class is XI MIA 2 and one control class is XI MIA 3. The results show that the learning using scientific approach assisted by "Aku dan Fisika" textbook is better than the learning of lecture method. The knowledge of students in experimental class increases and it is considered as high category. While in the control class increases and it is considered as medium category. Value of students' skills in experimental classes is 3,23 with category B+. The highest attitudes gained in both classes are the gratitude and meticulous attitude with the excellent category while the differentiating attitude between the two classes is the active attitude of asking. So it can be concluded that the average learning outcomes of using scientific approach assisted by "Aku dan Fisika" textbook is better than the learning of lecture method and the learning outcomes of XI MIA students of SMA Muhammadiyah 2 Surabaya can be increased after applying scientific approach learning assisted by "AkudanFisika" in center mass material.

Keywords: scientific approach, dynamic rotation, balanced.

INTRODUCTION

Education is one of the most important factors that a country needs to build its integrity. A good education will form intelligent generation tolead the country. So that the condition of the nation will experience better progress directly (Suyono and Hariyanto, 2011). The quality of education in Indonesia is still far from expectation.

According to the data from UNESCO, education in Indonesia is placed at 10of 14 growing countries in the world.Based on the data in education for all global monitoring report 2011 says that the rank of Indonesia's education is 69 of 127 countries in the world.The results of a study PISA (Program for International Student Assessment) 2015 shows that Indonesiaranks 69 from 76 the states**.** While from a study conducted by TIMSS (*Trends in International Mathematics and Science Study*), according to Ruri, shows that Indonesian students are on the upper 36 of the 49 states in terms of scientific perform procedure. Such facts are certainly painful for Indonesia's education world**.** Hence, Indonesia needs to improve itseducationquality (National Centre for Competence Based Training, 2007).

From that background, the government through the education ministry tries to increase the competitiveness of Indonesian education through the development of 2013 Curriculum (Sani, 2015). 2013 Curriculum is expected to become bearer of changesinside the educationsystem which is considered stiff and has not been able to build students' creativity in terms of cognitive, psychomotor, and affective (Ministry of Education and Culture, 2013). 2013 Curriculumis designedto increase students' participation more actively involved in learning process through question, observation, experiment, reasoning and communicating the results of learning (Yamin, 2011). 2013 Curriculumexpects a balance between the cognitive ability with the attitude and skill of students. The results of the application of 2013 Curriculum is the forming of human resources can improve their intelligence and attitude (Kokasih, 2014)

The application of 2013 Curriculum seems not maximally applied in several schools. From the approach, the application of 2013 Curriculum used scientific approach method (Trianto, 2013). Scientific approach is not fully understood by some teachers as the manager of policy in the school.A learning approach with a scientific approach requires students to observe, question, do experiment, do reasoning and communicate actively. Learning activities done by teachers in the implementation of 2013 Curriculum have not been in accordance with the construction. The fact in the field shows that teachers are still difficult to leave teacher center style (Duzankaet all, 2012). Teachers still dominate learning activities in the class, even though 2013 Curriculum expects that thestudents become activate in learning activities, while teachers only act as facilitators; whose duties accompany and direct students on the learning objectives.

SMA Muhammadiyah 2 Surabaya is one of five high schools in Surabaya that is appointed by TheEducation and Culture Ministry as a reference for other schools to have the same quality of education. Other four schools are SMA 2, SMA 5 , SMA Al-Hikmah and SMA Khadijah (Sarnapi, 2016). SMA Muhammadiyah 2 is appointed to be the sample of this study because this school has set 2013 Curriculum, but still not maximum.

Researcher gave questionnaire to the eleventh graders of MIA 2 of SMA Muhammadiyah2 Surabaya in the class. The results of the questionnaire show that 80 percent of the students are difficult to understand the existing material in Physics that is being learn. Some of the reasons are rigid language, the look of the book is less interesting and the description of the material is difficult to understand. Eighty five percent of students need Physics lesson book especially to the matter ofdynamicsrotation and the balance of rigid object witheasy and understandable presentation. Some suggestions for the expected book are interesting book view, language is not monotonous and the materials presented in accordance with scientific approach.

The results of interviewing teachers in SMA Muhammadiyah 2 Surabaya also says that the students get difficulty in understanding the dynamics rotation and the balance of rigid object because it needs much analysis. Students need guidelines book to give them some explanation based on scientific approach so that students easily understand the material (Satria, 2015).

In addition, researcher also conducts observations to the Physics learning process in the class. The learning is still dominated by teacherand students passively listen to him. The learning process isstill oriented on the knowledge while the attitudes and skill do not work. Such learning model is certainly not in accordance with the scientific approach.The application of this approach that only takes some stages will make students difficult to reach the learningobjectives (Wena, 2009). So it is not surprising that many students who do not reach the learning outcomes; which is determined 75.

To maximize the learning process according to scientific approach, the researcher takes the initiative to conduct research with the title **"Learning Based on Scientific Approach Assisted by Textbook of "Aku dan Fisika" in Dynamic Rotation and Balanced Material to Improve Learning Outcomes"**

RESEARCH METHOD

This research applies True Experimental Design with Pretest-Postest Control Group Design. The subjects of the study are students of XI MIPA 2 and MIPA 3 in Senior High School Muhammadiyah 2 Surabaya. This study uses experimental and control classes to compare them. Aspect that is measured is outcome of the study include attitude, skill and cognitive competence. The method used is pretest and posttest for competence result; experiment and when they do worksheet for skill result; while attitude aspect seen from student activeness during learning progress (Sugiyono, 2007)

RESULTS AND DISCUSSION

From the results of pretest and posttest value, the average of pretest and posttest value is obtained. The results as shown in table 1 with scale value 1 to 100 as follows:

Table 1. Average Comparison of Pretest and Posttest Value

Class	Pretest	Category	Posttest	Category
Eksperiment	38	C-	82	B+
Control	37	C-	54.25	C+

1. Research result
   a. Independent t test

      Independent t test is used to find out which one gets better learning outcomes between class that applies scientific approach learning that is supported by "Aku dan Fisika" textbook and class that uses lecture method. The first step is to arrange the hypothesis, then calculate t_{count}. From the calculation results, obtained t_{count} is 2.67 and t_{table} of 2.093. This means $t_{count} > t_{table}$, so it can be concluded that classroom learning outcomes that applies scientific approach learning with "Aku dan Fisika" textbook is better than class that uses lecture method.

   b. N-gain test (Gain Normalized)

      Having obtained the conclusion that there is a significant difference between pretest and posttest value in the experimental class (Riduwan, 2002). N-gain test analysis is used to describe how much improvement of learning outcomes after the application of learning using scientific approach of the textbook book "Aku dan Fisika". The result of N-gain test analysis is presented in Table 2.

Table 2. N-Gain Test Results

Number	Class	N<g>	Category
1	XI MIA 2	0,709	High

Table 2 shows that there is an increase in learning outcomes with high improvement categories.

c. Skill Competency Analysis

Skill competency assessment is obtained based on students'skill observation when conducting real laboratory experiments and studentsportfolio assessment (Yamin, 2013). Students' skill observation is assessed fromseveral indicators which are assessed by researcher as teacher and observer when students perform real laboratory experiments and portfolio assessments seen from the results of students' answers at portfolio sheet. Recapitulation of students' performance skill values in the experimental class can be seen in Table 3.

Table 3. Recapitulation of students' performance skill

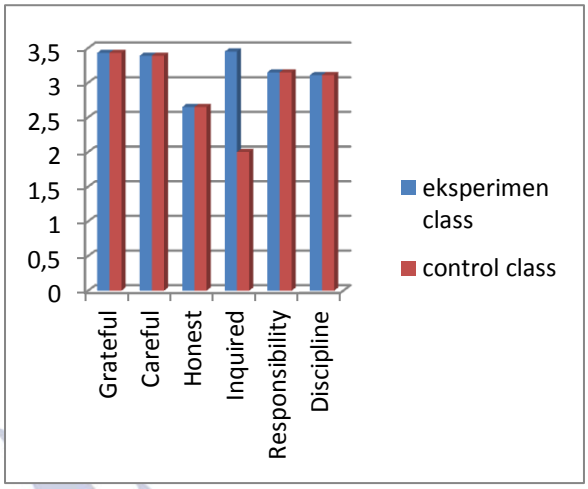
No	Class	Performance	portofolio	Final score	Category
1	XI MIA 2	3.21	3.25	3.23	B+

Table 3.shows the total skill score in the experimental class of 3.23. Based on the data, it is known that the final score of skill in the experimental class has exceeded the minimum skill value criteria of 2.51 i.e. B-category.

d. Attitudinal Competence Analysis

Assessment of attitude competence is obtained based on observation of students' attitude when students follow the learning process (Sukmadinata and Nana, 2010). Students' attitudes are assessed through observation during the learning process with an attitude observation sheet. Researcher is assisted by peer as observer. The results of the attitude assessment recapitulation to the two classes can be seen in Table 4.

Table 4. Result of Recapitulation Assessment of Attitude



Assessment of attitudes based on the assessment rubric in the observation sheet. Aspects of the attitude are observed in this study are grateful, meticulous, honest, active inquiring, responsible and disciplined.

2. Discussion

The objectives of the research are to describe the averagelearning outcomes with scientific approach based on "Aku dan Fisika" textbook is better than the lecture method in the teaching and learning process and to describe the improvement of students' learning outcomes after the application of scientific approach using "Aku dan Fisika".

a. Description of Learning Outcomes

To find out which of the better learning results between the experimental and control classes, independent statistical testcan be used. Based on the results of t independent calculation, obtained tcount. equal to 2.67 and ttable of 2.093. This means $t_{count} > t_{table}$, so it can be concluded that experimental class learning outcomes are better than control class. This is due to the different stages or syntax used by scientific based approaches with lecturing methods in which students become subjects in learning or commonly known as the Student Centered Learning (SCL) in the learning - based scientific approach. In applying the concept of Student Centered Learning (SCL) students are required active and independent in the learning process within certain limits learners can choose for themselves what will be learned (Harsono, 2005: 176). While in the lecture method, students become the object of learning so that the dominant teacher actively provide the material (teacher center). Teacher centered is a learning approach based on the view that

teaching is imparting knowledge and skills (Smith, in Sanjaya, 2008: 96).

Based on the Minimum Achievement Criteria (MAC) that has been established in SMA Muhammadiyah 2 is 75, in the experimental class there are 6 students who have not reached MAC and in the control class there are 17 unfinished students. This suggests that learning using a scientific approach is more effective to increase learning outcomes than learning using lecture method.

b. Knowledge competence

The result of n-gain test shows that the difference of n-gain test result is quite significant. This is due to the treatment of different learning approaches. From the calculation of n-gain in the experimental class, the value of n-gain is 0.709 or high category, whereas in the control class the n-gain value is 0.3 or the medium category. So it can be concluded that the application of learning using scientific approach based on the teaching of "Aku dan Fisika" textbook in the experimental class can improve learning outcomes significantly, while in the control class with lecture method can improve learning outcomes but not significant.

Learning using scientific approach using "Aku and Fisika" textbook with the stages of observing, asking, trying, reasoning and communicating will help students in constructing the understanding independently and actively because this learning is centered on the students. Scientific-based learning approach provides space for learners to recognize, understand various materials using a scientificapproachthat information can come from anywhere, anytime, regardless of the direction of the educator (Daryanto, 2014). The goal of learning with a scientific approach is based on the superiority of the approach.

c. Skill Competency

As shown in Table 3, if the average value achieved by students is 3.21 or included in the B + category, it is supported by a scientific approach. Scientific approach is a way or mechanism of learning to facilitate students to gain knowledge or skills by procedures based on a scientific method (Kemendikbud, 2013). At the stage of scientific approach there is trying stage. At this stage students will demonstrate their skills in conducting experiments. This proves that learning using scientific approach cantrain students' skill competence.

d. Attitude Competence (Spiritual and Social)

Table 4 shows that the highest attitudes gained in both classes are agrateful and meticulous attitude with very good category. While the differentiating attitude between the two classes is the active attitude of asking. In the experimental class, the active attitude of askingisincluded in very good category while in the class of control it is considered as enough category. This is due to the experimental class students are encouraged to ask, whereas in the class of control students are passivelylistening. Other attitudes likehonesty, responsibility and discipline fallintothe category either.

Different attitudes of eachstudent are influenced by various characteristics and different ways of learning. Based on the theory of learning about how each person learn in accordance with the character of each individual attitude itself (Suyono and Hariyanto, 2011: 78). Habits of students in being scientific and interacting with his friends will affect his behavior in everyday life. Attitude is a trait that can belearned and can affect a person's behaviour towards objects, events or other living things. A group of important attitudes isour attitude towards others (Dahar, 2011: 123). Scientific attitude is one of the objectives of learning using scientific approach with the help of "Aku dan Fisika" textbook.

CONCLUSSION

Based on research data, analysis, and discussion can be concluded that firstly, the average learning outcomes with the scientific approach is assisted by "Aku dan Fisika" textbooks is better than the lecture method. Secondly, students' learning outcomes in knowledge competencies increases significantly in the experimental class with the improvement of gained scores which is categorized high and the learning outcomes of control class increases in medium category. Thirdly, students learning outcomes for experimental class on skills competence of 3.23 with category B +. Fourthly, students' learning outcomes for the experimental class and the control classon the skill competence are very good. But the aspect of the questioning category in control class is sufficient. Based on the research that has been done, there are some suggestions as follows:

(1) Scientific-based learning approaches need the help of textbooks created by educators to help students learn independently according to the stages of the scientific approach. (2) Scientific-based learning approach with the help of textbooks in accordance with scientific approach phases can be applied to other physics materials. (3) Scientific-based learning approaches generally require experiments, so that appropriate time is required for learning to take place as planned.

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