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PREFACE

Assalamu'alaikum warahmatullah wabarakatuh

It is my pleasure to be able to bring the International Conference on Mathematics and Natural Sciences Proceeding to our readers. It took an extra effort, time and patience to accomplish this proceeding and it involved reviewers from all over regions. I personally thank to our reviewers and subsequently apologize for the delay in making this proceeding available for you to read. It is largely due to the inevitably extensive reviewing process and we persist on our initial idea to keep the proceeding both readable and academically meet a higher standard.

This proceeding is presented in six sections: 1) Invited Speakers; 2) Physics; 3) Mathematics; 4) Biology (including pharmacy and agriculture); 5) Chemistry; and 6) General Education. All sections consist of papers from oral and poster presentation in respective subject, including science and science education.

I hope that this proceeding may contribute in science and science education.

Wassalamu 'alaikum warahmatullahi wabarakatuh

Lalu Rudyat Telly Savalas

Chief Editor

OPE-3

Device Development of Physics Learning with Scientific Approach and the 5E (Engage, Explore, Explain, Elaborate, Evaluate) Learning Cycle Model to Increase Student's Life Skills

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Abstract-The purposes of this research are: 1) to develop a physics learning device with scientific approach and the 5E (Engage, Explore, Explain, Elaborate, Evaluate) learning cycle model; and 2) to test the effectiveness of the learning physics device with a scientific approach and the 5E learning cycle model in an effort to improve students' life skills. Physics learning device developed consists of: Syllabus, Lesson Plans, Subject Matter Book, Student Experiment Sheet, Three Dimensional Media, and Student Achievement Test integrated with life skills. Device development model used is the Four D model (Define, Design, Develop, and Disseminate). Define phase aims to establish and define the requirements that are needed in the learning based on the needs analysis, analysis of student, task analysis, analysis of the concept, and the formulation of learning objectives. Design phase aims to design learning device prototype. Develop phase aims to produce learning device which has been revised based on input from the validator. Disseminate aims at the implementation stage of the learning in the classroom. The phase of Define, Design, and Develop were implemented in the first year, while the Disseminate phase will be conducted in the second year. The score of Validator assessment of the learning device is in the range 1 to 4. The Validator provides an average score of 3, which means that the quality of learning device fit to use because it is in a good criteria and slightly revised.

Keywords: learning cycle, life skills.

1. Introduction

Students life skills in senior high school such as private Madrasah Aliyah (MA) incorporated in Rayon 03 West Lombok is still relatively low when compared with provincial and national. It can be seen from the percentage of mastery of the Physics material matter at National Examination in the Academic Year 2009/2010 under 60% is still quite a lot (Jufri, et al., 2013), as shown in the following table.

Table 1.Percentage of mastery of the Physics material matter at National Examination

Numbers Matter	Ability Tested	Rayon	Provincial	National
4	Calculating the value of the motion system objects in images associated with a strap on a flat, smooth	55.75	70.35	81.02
7	Analyze the relationship between magnitudes associated with rotational motion	0.00	2.84	55.42
11	Determine quantities related to the law of conservation of mechanical energy	11.95	45.73	68.36
25	Comparing the Coulomb force a distance of 1 charge be changed with another charge	12.39	32.82	43.29
36	Calculating the electron energy changes experienced excitation of the data necessary	53.98	80.31	81.08
40	Identify the benefits of radioisotopes in the life of the types of radioactive materials	11.06	24.83	34.73

Based on the interview with the Chairman of the Working Group Madrasah 2 West Lombok stated that the implementation of the scientific approach as expected has not been fully implemented by teachers in all subjects so that it becomes one of the causes of the low quality of education and the nation's competitiveness. Remarks Chairman of the Working Group Madrasah is reinforced by the results of the analysis IBM Program Team, Jufri, et al. (2013) on the ability of teachers in Science (Biology, Physics and Chemistry) in designing innovative learning tools based lesson study before being given the training needed to be improved. The ability of teachers in designing learning device associated with the level of scientific literacy and inquiry of the teachers concerned. Jufri & Hikmawati (2012) found that the level of scientific literacy (46%) and inquiry (59%) of teachers teaching science in Lombok is still relatively low.

The foregoing is certainly a problem of education that needs to be addressed by the parties concerned, including universities. The research activities on the development of the learning device physics with scientific approach and the 5E (Engagement, Exploration, Explanation, Elaboration, Evaluation) learning cycle model is one of the things that can be done in an effort to improve the life skills of students in private Madrasah Aliyah West Lombok.

The purpose of this study is to contribute directly to the improvement of the quality of education through improvement of process quality and learning outcomes physics Madrasah Aliyah in Madrasah Working Group 2 West Lombok. The specific objectives of this study are as follows: (1) Develop a learning device physics with a scientific approach and 5E learning cycle model consisting of: syllabus, lesson plans, books Topic, Student Worksheet, Media Three Dimensional, and test results are integrated with the learning of life skills; (2) Test the effectiveness of the learning device physics with a scientific approach and 5E learning cycle model in Madrasah Aliyah contained in Madrasah Working Group 2 West Lombok.

2. Research Methods

The development of learning tools model in this study using a model four-D (Define, Design, Develop, Disseminate) as suggested by Thiagarajan, Semmel, and Semmel in Trianto (2008) and Ibrahim (2003). Define phase aims to establish and define the conditions needed for learning is determined on a needs analysis, analysis of student, task analysis, analysis of the concept, the formulation of learning objectives. Design phase aims to design prototype learning device to perform the preparation of lesson plans, selection Book format Topic and Student Worksheet, media visual three-dimensional models, and test results are integrated with the learning of life skills. Develop phase aims to produce learning tools which have been revised based on input from the validator. Disseminate aimed at the implementation stage of the learning in the classroom.

Phase Define, Design, and Development was implemented in the first year, whereas Disseminate phase will be conducted in the second year. The study design to test the effectiveness of the device in the second year uses one group pretest-posttest design because it only uses a single group without a comparison group (Arikunto, 2006). The first step measurement as the initial test, then subjected to treatment in a given period of time, then performed the final test. The application of classroom learning tools will be done in Madrasah Aliyah Class X contained in Madrasah Working Group 2 West Lombok. This design was chosen because according to the research objectives as previously described. But it must be acknowledged that the study design like this still has weaknesses, especially in terms of testing the influence of the independent variable (the learning device physics with a scientific approach and 5E learning cycle model) on the dependent variable (life skills). It is caused by the disuse of the control group. To reduce the weakness, in this study carefully analyzed aspects of the sensitivity of the items obtained from the students' initial test and final test.

The sensitivity of a test is the test's ability to measure the effect of learning. In other words, a matter which sensitivitis means the matter can provide information that the measurement result is a result of the learning is done (Ibrahim, 2005). Analysis completeness or achievement expressed as a percentage of student learning that individual completeness Percentage (Pindividual) and classical completeness (PKlasikal). Assessment activities carried out by observing the class each time face to face. Observations were made by two observers, observations were made every 2 minutes. Based on the average assessment of two observers to each category observed, for each Learning

Implementation Plan will be determined percentage (P). Assessment of the feasibility study using a scientific approach and 5E learning cycle model is done each time face to face by two observers. Criteria for each phase in the syntax in question is implemented and not implemented, then expressed in figure 1 with the lowest score and the highest score 4. From the scores are calculated percentage. Neither the student response, will be analyzed by descriptive quantitative percentage. Developed learning tools fit for use if the quality of lesson plans, books Topic, Student Worksheet, media three-dimensional model of teaching and learning are test results in both categories. Implementation of effective learning device is said to support learning activities if the enforceability of lesson plans, student activities, student responses, and student learning outcomes categorized either.

3. Discussion

3.1 Scientific Approach

Scientific approach in learning includes observing, ask, reasoning, tried, forming networks for all subjects. The learning process with this approach touches three domains, namely: attitude, knowledge, and skills so that the learning outcomes of students who gave birth to a productive, creative, innovative, and affective through the strengthening of attitudes, skills and knowledge are integrated. The realm of attitudes include the transformation of a substance or teaching materials that the students "know why." Realm of skills include the transformation of a substance or teaching materials that the students "know how". The realm of knowledge include the transformation of substance or teaching materials that the students "know what it is." The end result is an increase and balance between the ability to be a good man (soft skills) and people who have the skills and knowledge to live a decent (hard skills) of the participants learners that includes aspects of competence attitudes, knowledge, and skills (Kemendikbud, 2013).

Ibnu (2014) argues that the purpose of the curriculum to pursue the adequacy of material facing the National Examination Schools / Madrasah and the policies of the lack of proper education authority gave a large contribution to the development of unfavorable conditions skill development (scientific approach) in students. Widespread public perception of the success of education is also already one. Parents are more likely to respect and pride when her son honored ranks in the classroom, school and even the region than on the skills their children to practice the scientific approach and process skills. It educates children if necessary to take shortcuts to achieve mastery of teaching materials without a good learning process. Ibnu suggest that students should be familiarized with the scientific process skills and independence in learning.

Learning tools developed in this study is an effort to improve the life skills through the application process skills approach to learning. The use of student worksheets and three-dimensional media in this study is expected to increase the activity of students in the experiment to prove to yourself the truth of the theory contained in Dynamic Electrical material. Student worksheets can train students to make hypotheses, conduct experiments, collect data, analyze data, and make conclusions.

3.2 The 5E Learning Cycle Model

According to Bass, et al, (2009), a cycle of learning (learning cycle) was first developed by Robert Karplus in 1960 in the program the Science Curriculum Improvement Study (SCIs). Learning cycle consists of three phases: discovery, invention concept, and concept application. In 1989, developed into the learning cycle model 5E model by the Biological Sciences Curriculum Study. Phase 5E learning cycle model adapted from Bass, et al, (2009) is as follows.

Table 2. Learning Phase in 5E Learning Cycle Model

Phase	Student Activity
Engage	Asking questions about objects, living beings, or the events of daily life.
Explore	Plan and conduct simple research to collect relevant data.
Explain	Using the data and scientific knowledge to explain his understanding.
Elaborate	Develop strategies, concepts, principles, and understanding towards new issues and questions.
Evaluate	Demonstrate the knowledge, understanding and skills using inquiry strategies through formal and informal formative assessment.

Lesson plan using 5E learning cycle model for the subject matter: potential difference, emf source, and the electric current requires the allocation of a 2-hour lesson (90 minutes). The purpose of learning is after conducting the demonstration, experiment, question and answer, and discussion, students can:

1. Explain the difference electromotive force (emf) and voltage clamp
2. Describe the source of electromotive force (emf)
3. Explain the concept of electric current
4. Assembling simple electric circuit
5. Describe the relationship chart strong electric current and potential difference
6. Formulate relations potential difference with the electrical current in the conductor ohmic
7. Applying current concepts to solve problems related

The following activities are carried out at every stages of 5E learning cycle model for Dynamic Electrical material.

Table 3. Application of 5E learning cycle model for dynamic electrical material

Time Allocation	Stages	Activity
Introduction (10 minutes)	Engage	<ul style="list-style-type: none"> • Students begin learning to pray • Students observe a simple circuit, in the form of batteries, connecting cables, and lamps. Then students watched demonstrations shown by the teacher. Teacher asks: 1) "why the lights can be lit?" Answer: because there is no electricity; 2) "why can appear an electric current?" The answer: because there are battery; 3) "why the battery can generate an electric current?" The answer: because no potential difference between the poles of the battery; 4) What is the relationship potential difference and electric current? • Teachers express purpose of learning today
Core activities (70 minutes)	Explore	<ul style="list-style-type: none"> • Students observe the demonstration 1 (in the teaching materials) on the source of the electromotive force (emf). After that the students do questions and answers related to the demonstration to understand the concept of emf source. Guided by the teacher through the questions, the students also understand the concept of electromotive force (potential difference) • Furthermore, students are directed to understand the concept of electric current with a question and answer technique. Students are given the problem: what is the relationship strong electric current and potential difference? • Students are divided into 8 groups, each group consisting of 4 to 5 students. Students perform experiments on the relationship potential difference and electric current in a closed circuit loop (no on teaching materials) with the help of Student Worksheet 1. For students doing experiments, the teacher directs and conduct performance appraisal
	Explain	<ul style="list-style-type: none"> • Students discuss with the group about the experimental results obtained, ie the relationship potential difference and strong

		<p>electrical currents they earn</p> <ul style="list-style-type: none"> • One representative group of students presented the results of experiments they earn. Another group to give feedback and comments. During the class discussion, the teacher gives a correction to the draft obtained by students
	Elaborate	<ul style="list-style-type: none"> • Students are given the strengthening of the concept of potential difference, a source of electromotive force (emf), as well as electric current
End activities (10 minutes)	Evaluate	<ul style="list-style-type: none"> • Student learning is directed in order to conclude today. Expected conclusion is: the ohmic conductor, the potential difference comparison with a strong electric current is constant. This statement represents a decline of Ohm's Law • Students answer questions reflection of the teacher to determine the extent to which students understand the lesson today • Students are given homework to make an article about the sources of emf often they encounter in everyday life

Research Lawson (2001) found that the learning cycle model has proven effective in helping students form concepts and conceptual systems and develop a pattern of reasoning that is more effective, especially because it allows students to use reasoning (if / then / as it is) to test their ideas could participate in the process of knowledge construction. Usmiatiningasih research results (2013) show that the learning of physics in the subject matter of Light with 5E model is able to develop critical thinking skills and students' attitudes toward science. Students can formulate the problem, observing, analyzing, presenting the results, and communicate the results of the work in class discussions. Hikmawati (2015) concluded that the application of the learning cycle model 5-E (Engage, Explore, Explain, Elaborate, Evaluate) in the learning of physics is an effort that can be used by teachers to achieve the expected goals. Based on the research of experts and observers of education, this model can develop students' life skills, in addition, learning cycle model can also be applied at every level of education from primary school level, secondary, and college students.

3.3 Life Skills

World Health Organization (WHO) in Khera and Khosla (2012) defines life skills as the ability for adaptive and positive behavior that enable individuals to deal effectively with the demands and challenges of everyday life. Further explained that the United Nations International Children's Emergency Fund (UNICEF) defines life skills as changes in behavior or behavioral development approach designed to address the balance of three areas: knowledge, attitudes and skills. In other words, life skills are skills necessary for successful living.

Life skills is a skill that must be owned by the students (learners) to dare to face the problems of life and living naturally without feeling pressured, then proactively and creatively search for and find a solution so that they can overcome them. Life skills consist of General life skills and Specific life skills. General life skills consisting of personal and social skills, while the life skills that are specific comprised of academic and vocational skills. According to Anwar (2006), life skills is one of the key words in the development of a good education in the nuances of academic education (academic skills) and education which is vocational (vocational skills).

Life skills-oriented education program through a broad-based approach or are known as the Broad Base Education is very possible to be implemented on any type and level of education. In addition the system does not change the existing curriculum, this program does not add to the burden of new subjects, but only change the orientation of the learning program (BBE Team, 2012). According Mugambi & Muthui (2013) argues that the curriculum of life skills plays a major role in allowing students to use the knowledge, attitudes and values into capability on what to do and how to do it. Some of the factors that affect the implementation of the curriculum of life skills, namely: teaching approaches, lack of conceptualization of life skills, human resources are limited, lack of supervision, teacher preparation is still lacking, a lack of choice of strategies and learning, limited use of learning resources, assessment methods were bad, and negative attitudes of students

towards life skills. Implementation of Life Skills Education depends mainly on the competence of teachers on the other hand also influenced by extrinsic factors.

In this research, the development of the learning device physics approach to scientific and learning cycle model 5E intended to enhance students' life skills Madrasah Aliyah in Madrasah Working Group 2 West Lombok especially their academic (thinking skills and cognitive learning outcomes) and social skills (ability to cooperate and communicate oral and written).

3.4 Results

Learning tools developed in this study is a prototype learning device physics with a scientific approach and 5E learning cycle model in an effort to improve the life skills of students in secondary schools. Learning tools developed in this physics lesson consists of 6 components, namely the syllabus, lesson plans, books Topic, Student Worksheet, Media Three Dimensional, and test results for the material Electric Dynamic Learning to Competency Standards: Applying the concept electricity in a variety of problem solving and technology products. Basic Competency for standards of competence are as follows: 1) Formulating electrical quantities simple closed circuit (one loop); 2) Identifying the application of electric AC and DC in everyday life; 3) Using the electrical measuring devices.

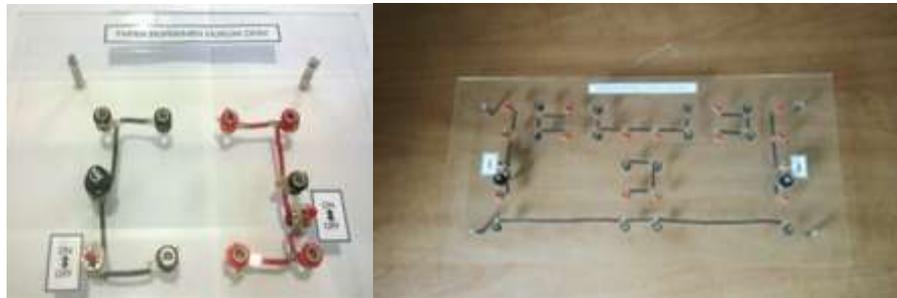
Table 4. Note from the Validator on Learning Tool

No	Component	Note
1	syllabus	<ul style="list-style-type: none"> • Consistency in writing Student Worksheet (LKS) or Student Experiments Sheets (LES)
2	lesson plans	<ul style="list-style-type: none"> • Stages is good, but to write a meeting just hours after meeting writing to 1, 2, 3, and so on (do not need to be sorted to the bottom) • For teaching materials, simply write its subject matter alone, while the description is imprinted on the material Books Topic • In the teaching and learning activities, to stage E1, unnecessary to mention the desired answer for the question serves as motivation. In the E1 phase, the teacher presents the objectives of learning, instead of delivering learning. For E1, to consider ways of writing from the beginning to the last, to be consistent.
3	books Topic	<ul style="list-style-type: none"> • For an introduction to the tools that will be used in the experiment is added in the learning material, so that at the time of the trials was too dangerous and display Student Worksheet not too much (can make students become bored) • At the time of presenting the material, teachers can use the method of demonstration
4	Media Three Dimensional	<ul style="list-style-type: none"> • The components and procedures are adequate to support device for use in research • Some editors and instructions should be made more operational
5	Student WorkSheet	<ul style="list-style-type: none"> • Display Worksheet Students should not be too much so as not boring students • To introduce experimental tools to students, teachers can use when learning demonstration • The purpose of the Student Worksheet must be specific, do not use the word understand or know, but the use of the verb operational
6	Test Results Learning	<ul style="list-style-type: none"> • Add instructions do problem • The option of choice, do not use capital letters when the sentence ends do not matter a question mark or exclamation mark • Option "all right" or "all wrong" should be replaced with "a and b" or "a, b, and c true"

Score Validator assessment of the learning device (syllabus, lesson plans, books Topic, Media Three Dimensional, Student Worksheet and test results are integrated with the learning of life skills) are in the range 1 to 4. Validator giving an average score of 3 means that the quality of learning tools developed fit for use because it is in a good and slightly revised criteria. Validator learning tool in the study are experts in the field of Physical Education, especially learning device,

namely: Dra. Hj. HaerunisyahSahidu, M.Pd. and Dr.Gunawan, S.Pd.,M.Pd.Here are some notes from the validator of learning tools that have been developed.

Here are some of the media three-dimensional documentation that has been developed in this research, about Ohm's Law and Kirchhoff's Law.



(a) Experiment board Ohm's Law

(b) Experiment board Kirchhoff's Law

Figure 1.Media three-dimensional

Three-dimensional media that have been developed in this research have been published under the title: "Pendekatan Saintifik dan Media Tiga Dimensi" and has the ISBN number: 978-979-1025-94-2. Here's the cover of the book in question.



Figure 2. Book Cover

Media three-dimensional as one type of learning media can be a model, namely the artificial three-dimensional of some real object that is too big, too far, too small, too expensive, too little, or too complicated to be brought into the classroom and students are learning in the form original. Some three-dimensional media are discussed in this book is the media three-dimensional refractive index, the pinhole camera, a long expansion, Ohm's law, black box resistor circuit, Kirchhoff's laws, and the Wheatstone bridge.

4. Conclusion

Device development models used in this study is a model of Four D (Define, Design, Develop, Disseminate). Phase Define, Design, and Develop has done since February to September 2015 (First Year Research). Validator gave an average score of 3, which means that the quality of the learning device (syllabus, lesson plans, books Topic, Media Three Dimensional, Student Worksheet and Tests Learning Outcomes are integrated with life skills) developed fit for use because it is in both criteria and slightly revised.Disseminate stage has the aim of implementing the learningdevice in the classroom to be done in the second year. The study design to test the effectiveness of the

device will use a one group pretest-posttest design. Implementation of effective learning device is said to support learning activities if the enforceability of lesson plans, student activities, student responses, and student learning outcomes categorized either.

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