Scientific Literacy: The Use of Android on Science Instructions Viewed on Project Based Learning

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Abstract. This study was aimed finding out the effects of project based learning model with android toward scientific literacy of the students in junior high school. This research was a quasi-experimental with nonequivalent control group design. The population were the entire students of grade VII SMP Negeri 2 Mataram. There are 80 students were treated as the sample of the study from two groups (experiment group and control group) which has been selected cluster random sampling. The experiment group was treated project based learning model with android, and the control group was given conventional learning media. The data in this study was analyzed by Independent-sample test. The result of the study showed that the project based learning model with android was given a significant effects toward scientific literacy of junior high school students. The results of t-test computation was 0.000 on the significance level of 0.05 (95%) and 0.01 (99%).

INTRODUCTION

The times demanding qualified young generation and able to compete in various aspects of life, one of them is science and technology. The effort that can be done in facing such competition is through education. Improving the quality of education is a very important thing to do, in order to produce a qualified education. The study results in “Programme for International Student Assessment 2012” indicates the average capacity of learners in Indonesia in science was ranked 64th out of 65 countries with below-average value that is 382 of 501 [1]. The ability of science literacy learners can be enhanced by several factors, such as the selection of strategies (methods and models) learning the proper use of ICT-based learning media, as well as the ease and frequency of accessing information via Internet [2,3,4].

Project-based learning is a learning model that uses the project as the core of learning activities. The project is the problems that occur in everyday life. Project based learning gives learners the freedom to solve these problems in groups or individually. Project based learning can produce learners who are active, creative, independent and critical thinking, as well as increase the motivation and learning outcomes of students [5,6,7]. Step-by-step project-based learning is as follows [2]: 1) Asking questions based on real problems/phenomena around, 2) designing stages of the project, 3) prepare project implementation schedule, 4) collecting, integrating, and interpreting data using mathematics, information, computer technology and computational thinking, 5) drawing up a report and presentation of products/results of the project, and 6) evaluating the process and results of the project.

E-learning is a form of applied information technology in education in the form of a virtual world [8]. Learning to use e-learning is learning that take advantage of Internet technology as a source of learning. Project-based learning via e-learning is a learning which provides an opportunity for learners to learn through diverse sources, facilitate learners in understanding the subject matter, makes the students more active and innovate in real time, and able to make an interesting and fun learning atmosphere [9].

Scientific literacy is the ability to understand, communicate, and apply scientific knowledge to solve problems in order to have the attitude and the high self-sensitivity and the environment in making decisions based on
considerations of science [10]. According to Abd-EL-KhalckiveBoujaoude, a person who has the ability of science is a person who knows concepts, principles theories about science, understands scientific process and realizes the connection between science and technology, society and environment [11]. The Indicators of a person who has the scientific ability include [2]: 1) have a knowledge and understanding of the concepts and scientific processes, 2) be able to find answers to the curiosity of everyday experience, 3) be able to read and understand and give validity of the conclusions of the article relating to science, 4) be able to evaluate the quality of scientific information, and 5) have the ability to demonstrate and evaluate the evidence based opinions. A research that has been conducted by RickaTesiMuskania and EndangDuwiSitiEliana using project-based learning model with e-learning media (website) in the learning of science provides results that learning is effectively improve the scientific literacy of middle-school learners significantly [2,12].

One of the tools and communication technology which most easily found and widely used are smartphone-based mobile phones. One of the operating systems used in smartphones is Android. Android is an operating system (mobile operating system) Linux-based modified. Linux is an open source operating system, while Android is open source and free. Open source and free means that the system is free to be developed and without royalty fees or distributed in any form [13]. It became one of Android virtues, making it easier for programmers to create new applications in it [13].

Android learning media is a media that combines elements of text, images, and sounds, and is used as a complementary learning. This medium presents the information in an attractive form that facilitate students to understand the information in a way to visualize it into an image or symbol [14]. Android learning media is a learning media that can be used anywhere and anytime which also supported by an interesting visualization [15].

Based on the survey results, the number of users of android system application in September 2015-September 2016 amounted to 72.34% [16]. This amount is quite a lot for users of mobile systems applications. Results of preliminary observations in the form of questionnaires use of mobile phones in the pilot project middle-school in Mataram city, an unknown number of Android-based smartphone users were 92 out of 105 students. However, the use of Android-based smartphones is more widely used for communication (telephone, SMS, and social media).

Android-based mobile phone usage is still very little used as a medium of learning, even in middle-school, Android-based instructional media or ICT-based media that can be used anytime and anywhere. Yet if such media can be used properly, it will give a very good influence on learning. The use of media that was applied to the android device can increase learning motivation, understanding of concepts, and creates a feeling of happy for learners [17].

Based on the explanation above, then a research is conducted to investigate how the influence of project-based learning science based learning aided by android media to scientific literacy learners. Learning science project based learning model based aided by android media in this study is a science teaching project that uses a model-based learning as a learning model and combine e-learning media (website) with android media as the media that supports learning process.

METHOD

Types, Places and Research Subjects

This research is a quasi-experimental research and designed with nonequivalent control group design. The study was conducted in November 2016 at the Junior High School 2 Mataram of West Nusa Tenggara. The populations in this study were all students of class VII SMP Negeri 2 Mataram in Academic Year of 2016/2017. The samples in this study were 80 learners consist of two classes (the control class and experimental class). The sampling technique used is cluster random sampling. In the experimental group was given an assisted project-based learning model android media, and in the control class was given a conventional learning model.

Instruments and Data Collection Technique

All learning and research instruments are using the previous development of research instruments (RickaTesiMuskania) which has been declared valid and reliable, and adapted to use android media. Data collection instruments to measure the achievement of scientific literacy of students use the form of a multiple choice test consisting of 25 items with four answer options. The tests to measure the achievement of scientific literacy is given and done online through the website.
Android media in this research were named Science Apps. And the websites that used is www.sciencertm.edu20.org. Websites that are used in this study is a research product that contains Muskania RickaTesi task and the subject matter, while the Android media used in this research is the development of researchers. Android media in this study contains elements of text and image, with the apk file format and size of 1.208 kb application. Science Apps consists of five main menus namely competence, material, LKPD, quizzes, and profiles. Android menu contains the media adopted from RickaTesiMuskania research products.

Menu "Competence" in Science Apps contains core competencies, basic competencies and learning indicators. Menu "Matter" in Science Apps contains materials being studied include materials energy transformation, cell metabolism and photosynthesis. Menu "LKPD" in Science Apps connected directly to the websites used in this study, so that students can directly access a given task through their smartphones. Menu "Quiz" contains multiple choice questions with four possible answers as much as five points, and always randomized automatically by the system. These issues are done with a time of 30 seconds, and the score will appear after all the matter is completed or until time runs out. Menu "Profiles" contains the identity of media makers. Android media has been declared valid by media experts.

FIGURE 1. Preview (a) menus; (b) menu “kompetensi”; (c) menu “materi”; (d) menu “quiz” in science apps.

RESULTS

Scientific Literacy Achievement

Data achievement of scientific literacy of learners gained from the pretest and post test scores were given to the control and experimental classes. The results of both test scores are used to find the value of the gain score, and the gain normalized score (n-gain scores). The following data are presented research results on Table 1:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Control Class</th>
<th>Experimental Class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
<td>Post-test</td>
</tr>
<tr>
<td>Min</td>
<td>20.00</td>
<td>40.00</td>
</tr>
<tr>
<td>Max</td>
<td>48.00</td>
<td>92.00</td>
</tr>
<tr>
<td>Average</td>
<td>34.70</td>
<td>70.80</td>
</tr>
<tr>
<td>SD</td>
<td>7.21</td>
<td>11.57</td>
</tr>
</tbody>
</table>

Based on Table 1 above its seen that the average pretest score for control class was 34.70 with a standard deviation of 7.21 and the average post-test score was 70.80 with a standard deviation of 11.57. If converted to a Likert scale [18] (Table 2), the average pretest score on control class included in the criteria is poor and the
average post-test scores in good criteria. In the experimental class, the gained an average pretest score was 28.30 with a standard deviation of 6.74 and an average score of post-test was 79.70 with a standard deviation of 10.84. If converted to a Likert scale the average pretest score in the experimental class include in the poor criteria and average score in post-test is in very good criteria.

Based on Table.1 seen that the average score gain normalized or N-gain [19] in the control class was 0.56 that included in the average criteria and the average score of N-Gain in the experimental class was 0.71 which is included in the high criteria.

| TABLE 2 The Students’ Achievement Criterion on Scientific Literacy |
|-------------------------|------------------------|------------------|
| Interval                | Scores                 | Criteria         |
| 75.00 < X               | A                      | Very Good        |
| 58.33 < X ≤ 75.00       | B                      | Good             |
| 41.67 < X ≤ 58.33       | C                      | Average          |
| 25.00 < X ≤ 41.67       | D                      | Poor             |
| X ≤ 25.00               | E                      | Very Poor        |

Average score achievement gains scores shown in Fig.2 for the control class was 36.10 with a standard deviation of 10.27 and the experimental class was 51.4 with a standard deviation of 10.7. Enhancement in learners’ scientific literacy amplified with the gain score analysis using T test to fulfill the prerequisites of initial advance.

**Scientific Literacy Achievement Analysis Results**

**Hypotesis prerequisite test**

Hypothesis prerequisite test which conducted is in the form of normality and homogeneity test (Levene Statistic) of the data gain scores in the control class and experimental class. The results of normality test (Kolmogorov-Smirnov) on both the control and the experimental class indicate that the data came from a normal distributed population. The homogeneity test results show the Levene Statistic score are greater than 0.05 which is equal to, 0.707. These results indicate that the data on the experimental and control classes have the same variance or homogeneous.

**Hypotesis Test**

Hypothesis test was done by Independent sample t test with significance level of 0.05. Based on the analysis aided by SPSS 20 for Windows obtained a score of significance (2-tailed) of 0.000. This result is smaller than the significance level (0.000 <0.05), then H₀ is rejected and means-based science learning project based learning android media aided significantly affect the scientific literacy of learners.

| TABLE 3. Independent Sampel t Test Results |

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Learning science-based project based learning aided by Android media give significant results in influencing scientific literacy learners. These results are consistent with results of previous studies conducted by Ricka Tesi Muskania and Endang Duwi Siti Eliana that based science learning project based learning through the medium of e-learning effectively improve the scientific literacy of middle-school learners [2,12]. Significant effect is shown by an increase scientific literacy of students in the experimental class of acquiring the average value of the gain score of 51.4. This value is higher than the average gain score class that implements the conventional teaching that only 36.1. This result was obtained because the learners are implementing project-based science learning based android media aided learning more active, creative, critical, and is able to solve the problem based on everyday life. The advantages are shown from the activities of learners during learning in the classroom, from the initial activities find daily problems that will be presented the project to the activities of products is the result of the work and thinking of learners. This statement is in accordance with the results of the study that project-based learning can make students to be active, able to solve the problem through the completion of the project, and provide opportunities to the learners in critical and creative thinking [7].

Besides learning science-based project based learning aided by Android media make learning activities more fun, flexible, and provide a broader knowledge. Learners acquire knowledge not only from textbooks, but also on the website has been prepared and Android media. These results are consistent with the opinion of Paul Horpyniux stating that the project based learning allows students the opportunity to use technology as a support to Reviews their learning [20]. These results are also in accordance with the study that the use of media that was applied to the android device can increase learning motivation, understanding of concepts, and create a feeling of happy learners [17].

**CONCLUSION**

Based on the results of data analysis and discussion, it can be concluded that the project-based science learning media aided by Android based learning can provide significant influence to the scientific literacy of learners.

**REFERENCES**

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