The Development of Science Mobile Learning Media to Improve Primary Students Learning Achievements

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Article Info	Abstract
	The development of science mobile learning is based on school condition which is lack of the use of technology. The lack of creativity and the uses of technology influencing study environment in class and has an effect in the student's result. So, it is needed to create some innovation in term of choose and use media. This research's goal is to enhance student's achievements. The type of research that used in this study is research and development (R & D). The stages in this research is used ADDIE (Analysis, Design, Develop, Implementation, and Evaluation). The research was carried out at SDN 2 Bobos & SDN 1 Cangkoak. For the test use n-gain test. Based on n-gain calculation, it show that the small sample obtain 0.61 and for the large sample reach 0.57, both in moderate categories. It can be conclude that science mobile learning can enhance student's study result achievements.

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INTRODUCTION

Information technology and communication is now growing fast in terms of the use of computer even mobile technology that often called as smartphone. It is becoming a primary needed for most of us due to it's benefits. Nowadays, the use of smartphone has two different effects; it has many advantages but also has many disadvantages too. Coaching from teacher or parents are necessarily needed so that when children use smartphone, they use it properly. The development of self regulation becoming important to give control ability to students. Self regulation is a process where students activated and preserve cognition, behavior, and influence that oriented in their ability to reach their goals. The improvement of technology also enhance the use of it including technology as media.

Media used in school is not optimal because in learning system most of media used are drawings, or even do not uses media at all. It has an impact in learning process and student's study achievements. Nawzad (2018) said it is important for learning system in a classroom to use technology as a media. The understanding of students will be influenced by the media used. Prasetyo (2017) started that the use of technology will make education easier and fun. The learning process that only uses drawings as media makes students feel less passionate due to the lack of stimulus and the learning will be boring for them.

A good learning must be uses a good media as well. Learning media is a tool to make student express their messages, it can also influence their thoughts, feelings, and willingness to stimulate learning process in students (Ahmadi, 2014). The use of media in learing process is one of some ways to create learning process that has high quality (Fakhruddin, 2017). A good learning media is based on technology, for example android Indrastyawati (2016). Mobile learning (m-learning) is a learning that focus in the advantages of technoogy and also as a tool with mobile system (Keskin & Metcalf, 2011). Based on this opinion, mobile learning media is very important because it can make learning more attractive to students. In addition, learning system in class will be monotonous if its only happen information transfer from teacher to student without involving an interesting media.

The use of mobile learning in elementary school is not without any reasoning. Based on survey that has been done by APJII *(Asosiasi Penyedia Jasa Internet Indonesia)* in 2006, it is proven that internet user in Indonesia is abundance. The survey involving 132.7 million Indonesian user. The result is must of them use internet only for fun, for instances: social media. 50.7% of them or 67.2 million user use it by mobile and computer. While users who only use mobile devices are around 47.6% or around 63.1 million, and those who only use computers are 1.7% or 2.2 million.

The results of this survey indicate that the majority of Indonesians access the internet using mobile devices. In terms of age, there are 6.3% of users are students, about 8.3 million students are familiar with internet use via mobile devices. The reason for using a mobile device is more practical when compared to PC devices. Muiz, A. (2014) the level of mobile device development is very high, the level of usage is relatively easy, and the price of devices is increasingly affordable, compared to personal computing devices. Although currently m-learning is still in the early stages of development and is relatively not yet well established, however, mobile learning media is expected to become quite rapid in the near term. According to Yektyastuti & Ikhsan (2016), the use of Android-based learning media is one of the implementations of the 21st-century learning style. With the development of this era, technology has indeed become familiar in various circles, not apart from the age of elementary school students. Learning by using mobile learning media can be stored for a long time in memory because of meaningful learning. As according to Suminar (2016) Long Term Memory (LTM) is part of the human memory system that stores information for a period that is long enough and is estimated to have a very large and very long capacity to store information, but only a few are activated.

Jihad & Haris (2012) learning outcomes are the attainment of a form of behavior change that tends to persist from the cognitive, affective, and psychomotor domains of the learning process carried out within a certain time. A good attitude in learning needs to be developed, Tebeanu (2013) cooperative learning is a socially oriented activity, where individuals collaborate with others to achieve the goals. These abilities are able to provide positive effects for students and are able to increase self-confidence or ability to interact, and train students to adapt to new environments. With this learning, it is expected to get good learning outcomes because in groups they will exchange ideas or knowledge in learning. Learning outcomes can also be improved through different learning media than before. According to Middleton & Perks (2014) states that learning outcomes are an impact of the learning process. If the learning is done through the right stage, the results will be good, and vice versa.

From the discussion, the formulation problem of the research in this study was determined including (1) how to develop science mobile learning media in grade IV elementary school, (2) what is the level of validity science mobile learning media in fourth grade elementary school?, and (3) do science mobile learning media can improve student learning outcomes. From the preliminary observations, it is found that the existing learning media use were very limited, so that the development of more innovative and renewable media is needed. Then it is determined the development of science mobile learning media because it is adapted to the development of the era and technological developments so that students can utilize the media in a better direction.

METHODS

The method of the research is research and development (R & D) with the ADDIE model which consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluation. Pribadi (2016) ADDIE development research is a research that can be used to develop learning programs that contain steps of analysis, design, development, implementation, and evaluation.

This is in line with the opinion of Prammanee (2016) that the stages in ADDIE are more clear and rational which begins with analyzing the needs in the study, followed by design and development accompanied by the implementation so that the four stages can be evaluated and known what are the deficiency and advantages. Using this research model can be better than other models because the phase is more obvious and rationale for development research.

Referring to Mulyatiningsih (2011) about the phase of ADDIE development research, it can be described as follows.

Analysis

The analysis phase is as a needs assessment process, to identify problems. At this phase of the analysis carried out by giving a needs analysis questionnaire to students and teachers. The questionnaire includes 10 points, 3 points about media analysis, 4 points about m-learning media analysis, and 3 points about topic analysis. To obtain the final results obtained in the form of characteristics or profile of prospective students, identification of needs and detailed. Analysis of learning media needs to be done to determine the feasibility if the learning media is applied.

Design

At this phase, the design carried out in media development is in the form of an initial design of the media to be developed (prototype). Prototypes made include (1) homepage, (2) menu navigation, (3) energy sources, (4) alternative energy types, (5) how to make windmills, (6) castor oil, and (7) observe the environment. This learning media design is still conceptual and will underlie the next development process.

Development

The Development Phase in this study contains the realization of product designs that have been previously designed. At the design stage, a conceptual framework for the application

of instructional media was developed. The conceptual framework is realized in products that are ready to be implemented.

The media is developed using the Google Site and web2apk applications. Then test a small sample with 5 students. Small sample testing results in an increase in student learning achievements, with the n-gain test that gets 0.61, including the medium category. For this stage everything that will be used or that will help the learning process must all be prepared carefully.

Implementation

The next phase is the implementation of research that is supported by instruments that have previously been designed and developed. This phase implements the media design that has been developed in the situation in the classroom.

The implementation of the large sample test was carried out in SDN 2 bobos and SDN 1 cangkoak with the number of students 59. There is an increase with the n-gain test result of 0.57, including in the medium category. The purpose of this phase is to implement developed media.

Evaluation

In this last phase, it aims to see whether learning using the developed media is successful or not. Evaluation refers to the development and implementation phase. It is known that learning is constrained because internet networks are sometimes less stable. This can be a concern for anyone who will do learning with m-learning media, can also be a reference for further researchers to pay more attention to the internet network.

The research subjects in this study were the fourth-grade students of SDN 2 Bobos and SDN 1 Cangkoak with the number of students 64. This determination was done by purposive sampling technique because the selection of sampling had a specific purpose. Selected schools that have basic facilities but have not maximized the function of these facilities and both schools have almost the same characteristics.
Test instrument validity using the Kolmogorov-smirnov test and reliability using the Lavene's test. To find out more clearly the effectiveness of learning media can be seen by comparing the pretest and posttest values with the n-gain test as purposed by Hake (1999). The following is the formula for the n-gain test to be carried out to process research data.

$$< g > = \frac{< S2 > - < S1 >}{Score\ Max - < S1 >}$$
(Hake, 1999)

Explanation:
S 1 = Score pretest
S 2 = Score posttest
Score Max = Score maximal

RESULTS AND DISCUSSION

Science mobile learning (SM-Learning) media is carried out by research with a predetermined phase, such as from analysis, design, modeling, research implementation and evaluation.

In the learning process carried out requires more innovative media that is different from the previous media. The mobile learning media was developed and used in primary schools because elementary school-age students are already familiar with the technology, but their of it is not optimal. So that m-learning media was suitable to support learning while directing students to use technology in a more positive direction. Sometimes students use smartphone devices just play.

In the analysis phase, do the initial analysis of the research subject. Analysis of the media needs questionnaire in learning shows the results of 10 points, 8 points show that the media needed does not yet exist or has not been implemented. So that it belongs to category 4, with information that is needed, so it is necessary to develop learning media.

At the design phase. this is the second phase that is carried out which includes the initial design or prototype and the determination of the topic to be loaded in the media. In the planning process, the initial design is carried out by making a prototype media design and the material that will be made into the mobile learning media. Media prototypes can be seen in Figure 1 & Figure 2.

Figure 1. Home

A home explanation is the earliest page when opening a mobile learning science application. There is navigation, search menu, title, KI / KD and at the very bottom, there is a profile of media developers.

Figure 2. Navigation Menu

Menu navigation contains the main subpages of learning media. There are menus, search menus, and sub-pages that include porches, energy sources, alternative energy, types, how to make a wheel, castor oil and observe the environment.

The draft includes the initial design of the media for making media in the next stage. The use of several web or media development applications goes into the design phase until finally, a web is determined to create an application that is a Google site that is supported by additional web2apk applications. The material designed to be integrated into the media is the 1st semester material for grade 4th elementary school. Material selection is tailored to the needs of students and the time of the research. Based on the results of observations in thematic learning in grade 4 elementary school, obtained data that the science scores get the lowest score. In this study science material was determined. The topic was chosen in theme 2 which contained topic science namely alternative energy.

At the development, the phase has the aim to develop learning media based on the prototype and planning of the topic that has been set. The process is based on the prototype so that the media created is in accordance with the initial planning. The development requires an application to create media. The development phase begins with entering the topic that has been designed into the media making a web, namely Google site. At this stage maximize the appearance of the media because of its use for elementary school students, the majority of whom focus more on something striking to attract their attention.

The creation of this media also added material from other sources to enrich the material contained in the media. Image and background adjustments are the main concern. Besides that, the video presented is relevant to the material. The next phase carried out was expert judgment for media and material to experts in their respective fields. Assessment based on indicators that have been established and revised based on advice from media experts and material experts.

This expert validation is carried out as an effort to validate sm-learning media which will later see an increase in student learning outcomes. In addition, validation also aims to provide suggestions and comments that the media used is in accordance with the standards and to minimize errors in the media. Following

are the results of media validation from experts in Table 1 below.

Table 1. Result of Mobile Learning Media Validation.

Validator	Device	Score	Results	Criteria
Validator I	Media	84 (84%)	79 (can be used with a little revision)	Valid
Validator II	Content	37 (74%)		

The evaluation sheet was tested by students using multiple choice questions, the number of questions consisted of 30 questions. This validity is used to find out whether the questions that will be used for evaluation are valid/not. So that after validation can be found a valid/no problem, and only valid questions that can be used in the study.

Tabel 2. Results of Validation of Evaluation Question

Explained	Question
Valid Question	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 15, 16, 18, 19, 21, 23, 24, 29, 30.
Not Valid Question	9, 13, 14, 17, 20, 22, 25, 26, 27, 28

From the test of the questions carried out to students to test the validation level of the questions, it was found that out of 30 multiple choice questions tested there were 10 invalid questions and 20 valid questions. So for the questions to be used in the research evaluation, there are 20 multiple choice questions.

A test is said to be reliable if the evaluation sheet to be used in the research can be trusted and consistent. This is indicated by the level of consistency of scores obtained by the subjects measured by the same instrument, or equivalent tools in different conditions. The reliability test results of the evaluation sheet using Cronbach Alpha with the results of 0.858.

From the results obtained from the reliability test evaluation sheet results obtained from the Cronbach's alpha test that the evaluation questions are reliable with a score of 0.858. Thus the multiple choice questions that have been tested are declared eligible for research.

Small-scale tests were carried out at SDN 2 Bobos by involving 5 students, and the data obtained from this small-scale test became a reference for large-scale tests. From these results, it can be seen if learning with mobile learning media at the pretest results 51 and the posttest results in 81. So the use of this media can improve student learning outcomes.

From the development process that has been carried out and through the expert validation phase or expert judgment, a mobile learning science as a media is produced in the form of an android application with apk format. This product can be installed in a smartphone device that uses an Android device. The main reason for the use of these devices is that their use is more practical and easy, both for students and for teachers.

Mobile learning of science as media products that have been developed can be seen in the explanation in Figure 3 until 6 below.

Figure 3. The Homepage Display is Shown by a Combination of Attractive Images and Colors.
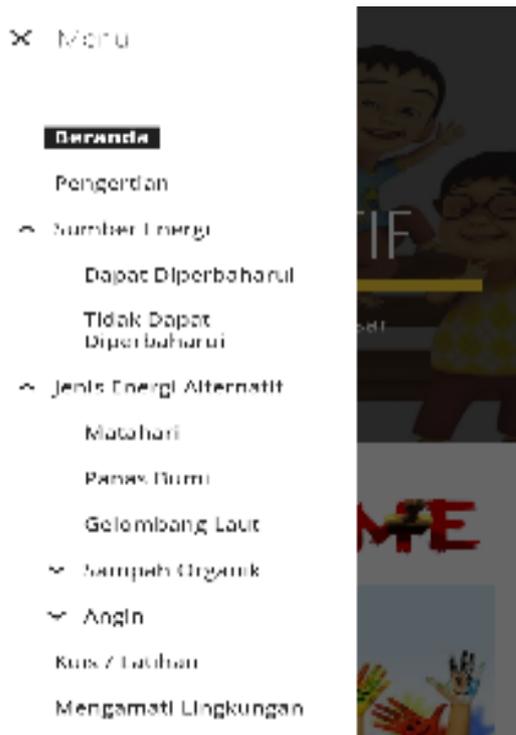
Figure 4. Menu Display

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Figure 5. The Developer Profile is Still on The Home Page

PENGERTIAN

Energi alternatif adalah energi yang digunakan untuk menggantikan energi dari minyak bumi. Energi alternatif memiliki sumbernya yang dinamakan sumber energi. Manusia

Figure 6. The Topic Page Begins with An Understanding of Alternative Energy

The following are some of the views of the developed media used in the study. From the media, research was carried out with a focus on increasing cooperation and learning outcomes of elementary school students. The following are the results of the implementation phase.

Large-scale trials aim to apply science mobile learning media that have been developed previously. In a large-scale test focused on knowing the improvement of students' cognitive learning outcomes through mobile learning. The implementation of this large-scale test was carried out in two schools, including SDN 2 Bobos and SDN 1 Cangkoak. The school was chosen because it was still in one area and was still in one sub-district. Besides having almost the same characteristics and based on needs analysis, both schools need innovative media in learning.

In the analysis of test data, the effectiveness of this collaboration was obtained from the results of learning with cooperative learning. As according to Rochmawati (2017) that the most important goal in cooperative learning is to teach

children about cooperation and collaboration skills. This increased data is data obtained from the difference between pretest and posttest carried out in the learning process. The gain analysis aims to see if there is an increase in the results of pretest before treatment and posttest after being given treatment. Then the data is calculated using the N-gain formula. So in this section, the following data will be improved.

Based on the learning and testing that has been carried out on this large scale the results of the data are as follows. Pretest data can give an overview of students' initial abilities before being given treatment.

Tabel 3. N-gain Recapitulation of Pretest and Posttest of Learning Outcomes

Class	Data		Gain	Criteria
	Pretest	Posttest		
IV	55.17	80.59	0.57	Medium

The data in Table 1 indicate the results that science mobile learning media can improve student outcomes, especially students' cognitive abilities. It can be seen from the results of the pretest before the treatment of obtaining the average results and after being given treatment seen from the posttest score obtaining a higher average result and the gain value obtained was included in the medium category. Thus it can be concluded that learning using science mobile learning media can improve student learning outcomes. At this evaluation phase is the last of research which is a phase to see how the media was used. Whether there are obstacles, can achieve learning goals. Also explained are the obstacles and advantages of the media that have been used during the research. Since at the end of each process an evaluation is carried out so that it can know the deficiency or advantages that can be used as a reference for the future.

Overall application of science mobile learning media is successful, it can be seen by increasing student learning outcomes themselves. Besides that, the success is seen from the achievement of learning goals that by using the videos contained in the media students can identify various kinds of alternative energy sources and with science mobile learning media

students can understand the material about alternative energy and understand the concept of energy use. Then also see the response of students who are very excited when using science mobile learning media. As for other obstacles, when using the media, some student not according to instruction and the type of cellphone used.

When viewed from all phase in the research and student reaction as learning with used the media. It can be said that the results are quite good because it has presented something new for students and teachers. Science mobile learning media has several advantages including having a variety of colors so that students can be more interested in this media. In the basic of characteristics student for elementary school are happy with striking and diverse colors. The aesthetics in giving colors are still considered, not just bright colors but adjusted to the background of the media page. The proportions of images, videos and text are also well considered so that there is no imbalance on one page. From these results, the science mobile learning media can improve student learning outcomes.

CONCLUSION

The development of mobile learning science media began with the creation of prototypes that were developed with the Google site and web2apk applications. Then validated by an expert to become valid media. From the treatment carried out in classroom learning, mobile learning science learning media can be categorized as effective because it can improve student learning outcomes in the learning process. This can be seen from the students' pretest and posttest that were carried out in the learning process and the final results obtained significant results.

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