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THE DEVELOPMENT OF SCIENCE MOBILE LEARNING WITH CONSERVATION VISION BASED ON ANDROID APP INVENTOR 2

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Abstract

The purpose of this research was to develop science mobile learning conservation vission based on android app inventor well tested and find out the user response to the application of mobile learning science as supplement materials of learning mobile based. The methodology used in the making of this application is the waterfall methodology. Science mobile learning applications conservation vission is expected to help the students in particular and the scientific community in general to get the ease of learning science concepts using a Smartphone device without having to print using paper (paperless). Applications of science mobile learning include by supporting features of images, videos and quizzes. The conclusions in this research that has generated the application of science mobile learning conservation vision feasible to use to learn the concept of science and efforts to reduce the use of paper (paperless), application of science mobile learning get good response from the community of users related to accessibility, suitability of the features and content of science, and its utilization which supports reducing the use of paper.

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INTRODUCTION

The development of multimedia technology has promised a big potential in changing one's way to learn, get information, adjust information, etc. Multimedia also provides a chance for education to develop a learning technique. The source of information does not focus on conventional learning like text in the book. It is wider than conventional learning. The low number of visual aid in school creates a difficulty for teacher in teaching and learning process so that students are hard to concentrate and understand the material delivered by the (Bustomi, 2010).

Learning is a process that happens as a result of the interaction between humans and their environment whether or not it is intentional. Humans have learned if there is a better improvement of their behavior and knowledge. The rapid development of technology has made the needs of a concept and mechanism of IT-based teaching and learning (in education) unavoidable. This concept is known as e-learning. The new branch of e-learning is mobile-based learning or called mobile learning. The emergence of mobile learning is caused by the demand to utilize some more sophisticated mobile devices (smart phone, tab, note-book) which have not been utilized in education. Besides, the total production of those mobile devices is greater than laptop and PC.

Generally, mobile learning is a learning media using mobile devices. According to Majid (2012), mobile learning is a learning approach involving mobile devices like cell phone, PDA, laptop, and PC, in which learners are able to access the material, direction and application related to the lesson without being measured up by space and time anywhere and anytime. In addition, mobile learning is also flexible because it can be changed or updated anytime when the material changes, especially in natural science whose theory is improved. Aside from its use for self-learning, mobile learning can also be used as a learning media which can be accessed anywhere and anytime (Tamhane, *et al.*, 2015).

Mobile learning is a new ICT improvement in education where mobile devices are used as learning media that contain of some materials or practical work aid so that they can be used inside or outside the school, and are lighter and portable. The greater number of people who use mobile devices gives a chance of using mobile devices for education, and more importantly, they are eco-friendly considering their function as paperless media.

Along with the vision of Mathematics and Natural Sciences Faculty of Unnes, namely conservation vision, religious, excellent, and meaningful, an innovation of future-oriented learning is needed, especially in terms of mobile learning media which supports paperless and conservation program. The number of academic society whether lecturers or students who own and use mobile devices with Android OP (Operational System) that provide some facilities including App Inventor 2 program is higher nowadays. MIT App Inventor 2 is a block-based programming tool which enables everyone, even a beginner, to start programming and building an application for Android.

The use of ICT in the learning process from planning, implementation and assessment is one way to realize Unnes conservation program through paperless policy or paperless program (Wusqo et al., 2016). One of the ICT tools is the presence of Science Mobile Learning that used as a complement for learning process and supports the vision of conservation in Unnes through the use of modern and paperless learning media. It gives a different experience in the learning process of science. Zhenget al. (2015) stated that smartphone develops rapidly nowadays. Its technology is not only utilized as a communication tool, but also as an excellent and user-friendly learning media. Therefore, the researcher conducted a research on the development of science mobile learning with conservation vision based on Android App Inventor 2.

Learning media, according to Bakri (2011) is everything related to software and hardware that can be used as a medium to deliver the learning material from a source to learner using a learning method which gives a feedback for the user based on the media input. The development of multimedia technology has promised a big potential in changing one's way to learn, get information, adjust information, etc. Multimedia also provides a chance for education to develop a learning technique. The source of information does not focus on conventional learning like text in the book. It is wider than just a conventional method. The limited number and function of laboratory equipment and science aids creates a difficulty for teacher in

teaching and learning process. Besides, students are also difficult to concentrate and understand the material. A research by Bustomi (2010) showed that android-based learning application can be used as an interactive media.

Prasetyo, (2013) stated that Natural Sciences can be defined differently based on the point of view used. Commonly, people define Natural Sciences as a set of scientific information. On the other hand, scientist views Natural Sciences as a method to test a hypothesis. While, philosopher may defines it as a way to question the truth of the known thing.

Android is a structure of some software stack. Stack generally includes operation system, middleware, and key applications (Eueung, 2012). Android has some versions such as Android 1.1, Android 1.5 (Cupcake), Android 1.6 (Donut), Android 2.0/2.1 (Enclair), Android 2.2 (Froyo), Android 2.3 (Gingerbread), Android 3.0/3.2 (Honeycomb), Android 4.0 (Ice Cream Sandwich), Android 4.2 (Jelly Bean) and Android 4.4 (KitKat).

Android provides an opened platformfor the developer to create new application. Android is a new generation of mobile platform, or a platform that enables the developer to develop it as expected. The operation system that underlays Android is licensed under GNU General Public License Version 2 (GPLv2), or known as "*copyleft*" license in which every reparation by the third party should be done under the terms. Android is distributed under Apache SoftwareLicense(ASL/Apache2), which enables the distribution of both open and close source derivation from code sources. The developers (especially handset producers) may choose to improve the platform without giving their reparation to other people's *opensource*. On the other hand, the developers are able to gain profit from the additional device like the reparation and re-distribute their works under any license they want (Putra, 2012).

App Inventor is a tool to make an android application. The fun part about this tool is that it is based on visual block programming, so that we can make an application without any code. It is called visual block programming, because the user will see, use, arrange, and drag-drops "block" which are known as the command symbols and event handler functions in application making. Simply we can call it coding-less. An example of a block program in App Inventor for a list of colors is shown in Figure 1.

The advantage of App Inventor lies in its easiness in programming because the user does not need to have basic programmer knowledge, understand codes, or have an experience in IT. The most important thing in making an application using App Inventor is how the programmer uses his/her logic like when someone arranges a puzzle. There are advance options for programmer to make an application based on the required standard.

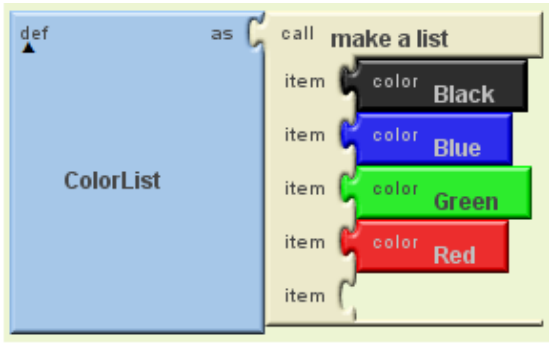

Figure 1. The display of block program in App Inventor

Framework visual programming which is related to programming language *Scratch* from MIT specifically is the implementation of *Open Block* distributed by MIT Scheller Teacher Education Program. App Inventor 2 is equipped with complete features, such as:

a. Just for fun

App Inventor can be an enjoyable thing like the facility to edit a picture, play puzzle, fill a crossword, or study as the basis to strengthen logic. Everything is enjoyable.

b. Learning tool

App Inventor can be used as a good learning tool. If we are a teacher or lecturer, we can make App Inventor as a teaching tool because visualization will help the students understand the material.

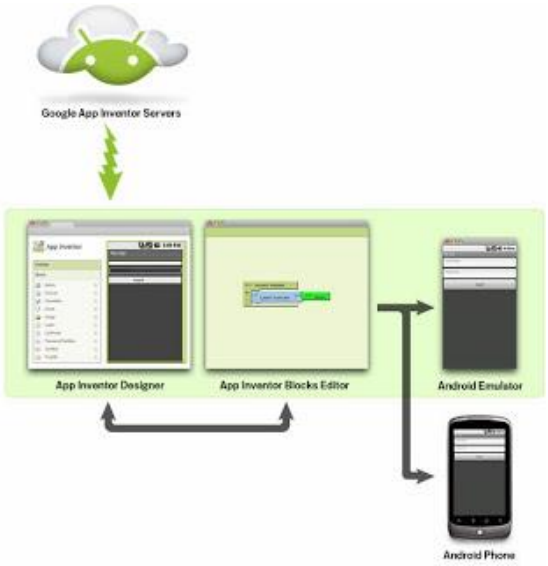

Figure 2. The programming system of App Inventor in Android OS

c. Making an application

The features are making a prototype, application for personal and organizational usage, or application for sale.A visual drag drops-based App Inventor does not require the users to memorize or recollect the instructions or program codes, and the event block components are completely available so that the users are able to utilize the application easily. As such an object, the users can assemble it with the components and blocks which are mutual to the function. The users need to put it just like a puzzle and change the property, for example giving number to set the timer, etc. Event handler helps handling every event in process.

The purpose of this research was to develop science mobile learning conservation vission based on android app inventor well tested and find out the user response to the application of mobile learning science as supplement materials of learning mobile based.

METHODS

This research was a development research directed to develop Science Mobile Learning with Conservation Vision Based on Android App Inventor 2. The subjects of this research were the students of Natural Science Education program academic year 2015/2016. This study was designed as Research and Development (R & D) using waterfall method. Waterfall model is a systematic and chronological classical model (Martono & Nurhayati, 2014).

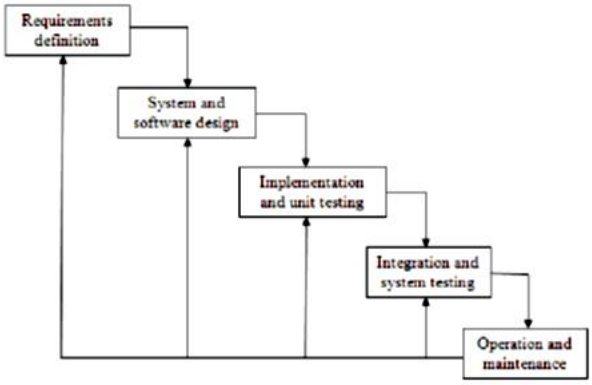

Figure 3. The development of waterfall method

a. Requirements definition

Requirements definition covered the collection of every thing that was needed to be analyzed in order to define the needs that should be fulfilled by the program. This phase needed to be done completely in order to produce a complete design. The requirements of this phase were the elaboration of eclipse material, the workflow of the program, and App Inventor software. In this phase, the researcher did not install the program, but accessed the program online on: *ai2.appinventor.mit.edu/*.

b. System and software design

After everything was collected and complete, the design was started to be made.

c. Implementation and unit testing

The design of the program was translated into some codes using the given App Inventor programming language. The program was tested directly whether it worked well or not.

d. Integration and system testing

It covered the assembling of the units to be tested as a whole (system testing).

e. Operation and maintenance

It covered the operation of the program in its environment and the maintenance, like the adjustment or the change to adapt with real situation.

The test of the product was done in a large group test. The test was done with the implementation of a learning process which was supported by Science Mobile Learning with Conservation Vision based on Android App Inventor 2. Questionnaire was used to collect information in the form of students' response towards the media of Science Mobile Learning

with Conservation Vision based on Android App Inventor 2.

RESULTS AND DISCUSSION

The Development of Science Mobile Learning with Conservation Vision

Use Case Diagram

Use casediagram is a conception of some interactions between components in the application of Science Mobile Learning with conservation vision from the system that is developed. The user is able to access the main menu which consists of five choices like material, picture, video, quiz, and exit. According to Taufiqet al. (2016), there are some important features in Android which can be used as a supporting content of learning meduia like: material, picture, video, and quiz. The material of Science Mobile Learning with conservation vision which is delivered can be packed more interestingly. It is easier to be understood because information is not only presented in written form, but also picture, video, and animation.

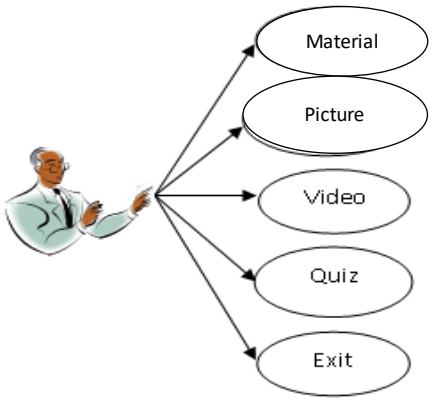

Figure 4. Use Case Diagram in Science Mobile Learning with Conservation Vision Application

Class Diagram

Class diagram is the core of object modeling process. It is a set of object classes. It contains of the explanation about the classes in the application system of Science Mobile Learning with conservation vision. Through a class diagram, a programmer designs an application system by describing some classes that will be used in the application.

Activity Diagram

Activity diagram focuses on the execution and system flow. It covers how the application system of Science Mobile Learning with conservation vision is made. Activity diagram shows the system's activity in a set of actions.

a. The Diagram of Accessing Material Activity

It describes the phenomenon of a user accessing the material menu.

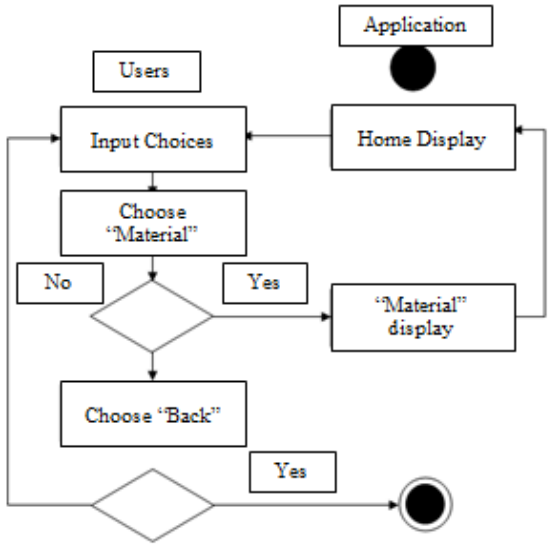

Figure 5. The Diagram of Accessing Material Activity

b. The Diagram of Accessing Picture Activity

It describes the phenomenon of a user accessing picture menu.

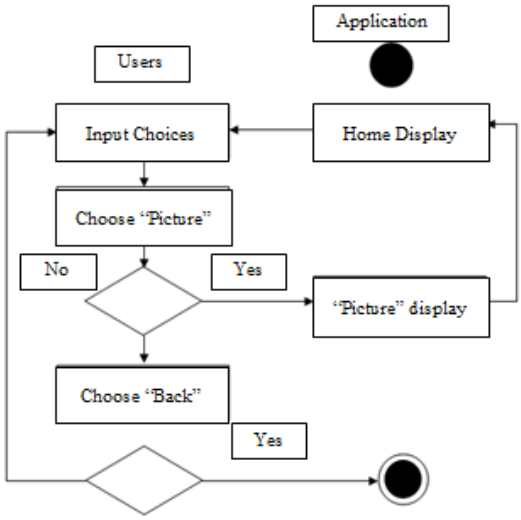

Figure 6. The Diagram of Accessing Picture Activity

c. The Diagram of Accessing Video Activity

It describes the phenomenon of a user accessing video menu related to the material.

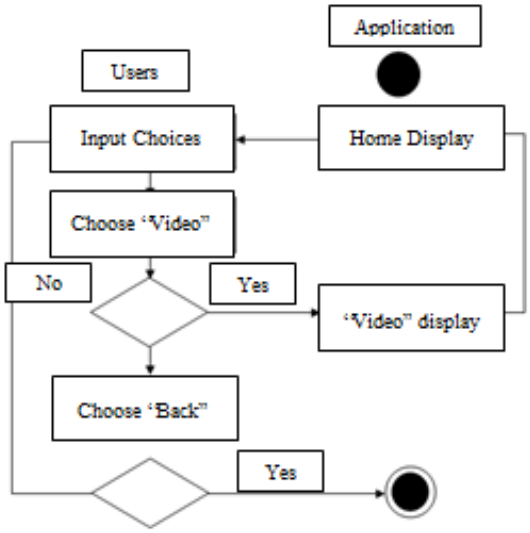

Figure 5. The Diagram of Accessing Video Activity

d. The Diagram of Accessing Quiz Activity
It describes the phenomenon of a user accessing the menu of exercise or concept mastery test.

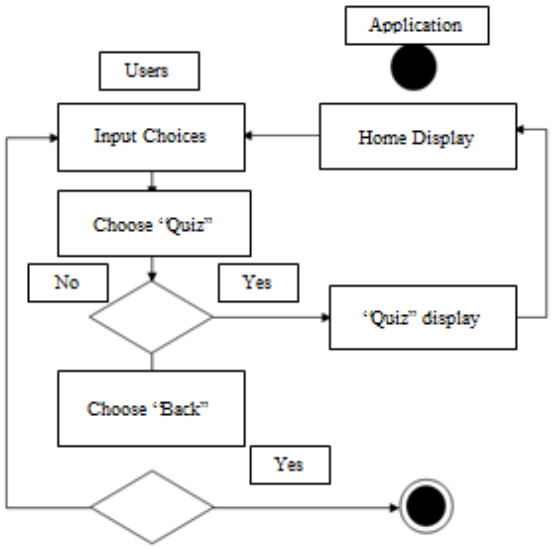

Figure 6. The Diagram of Accessing Quiz Activity

e. The Diagram of Accessing Exit Activity
It describes the phenomenon of a user accessing exit menu.

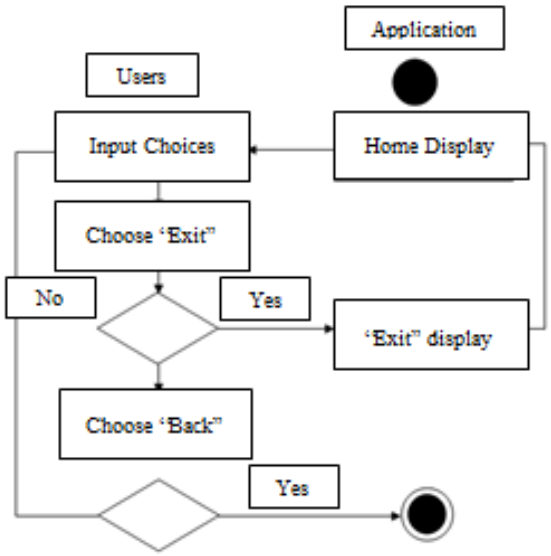

Figure 7. The Diagram of Accessing Exit Activity

The Validity of the Development of Science Mobile Learning with Conservation Vision

The validity of Science Mobile Learning with Conservation Vision was analyzed by media and material experts. The result was in the form of suggestion and comment used as reference to fix the application. Next, validity and analysis were done to calculate the average score, or the result of the acquired score divided by maximum score.

The percentage of experts' response which was collected through questionnaire was calculated by dividing the acquired score by the maximum score and multiplying it with 100%. The percentage was interpreted into some criteria as shown in Table 1.

Table 1. The Validity Percentage Criteria of Science Mobile Learning with Conservation Vision

Percentage Interval	Criterion
81% - 100%	Very Good
61% - 80%	Good
41% - 60%	Intermediate
21% - 40%	Poor
<20%	Very Poor

The validity of Science Mobile Learning with Conservation Vision in this research was including the validity of design and product. The validity was analyzed by the experts on media and material. The results were:

a. Design Validity

The scores of design validity questionnaire given by the experts are shown in Table 2.

Table 2. The Recapitulation of Validity Data by Experts on the Design of Science Mobile Learning with Conservation Vision

No	Validator	Average	Criterion
1	Media Expert	3.88	Proper
2	Material Expert	3.96	Proper

Based on the scoring result done by the experts, the validity percentage of the design is 98.44%, and categorized as very good. It means that the design could be applied for Science Mobile Learning with conservation vision after a few revisions were made. Media expert stated that generally the display was good, but it still needed a navigation button to help the user accessed the application. Besides, font color also needed to be fixed. Therefore, the display would be contrastive. The font type and size and link arrangement in the interface application needed to be adjusted to make it harmonic. The media expert stated that the programming was good.

Material experts stated that the learning material was good, but the picture should be adjusted with the concept and completed with its information. Generally the experts said that the media was good. The researcher revised the application based on the experts' consideration. After that discussion and evaluation were done to get a good and valid recommendation for Science Mobile Learning with conservation vision. In learning aspect, the experts stated that there were some materials whose presentations were less interactive. Generally the experts said that the application or media was good.

b. Product Validity

Product validity was analyzed by the experts on media and Natural Science material using questionnaire developed by the researcher. The result is presented in Table 3.

Tabel 3. The Recapitulation of Validation Data by Experts on the Product of Science Mobile Learning with Conservation Vision

No	Validator	Average	Criterion
1	Media Expert	3.92	Proper
2	Material Expert	3.96	Proper

The strength of the application was that the media had complete components such as material, picture, video, and quiz. There were some important supporting features in Android program like: material, picture, video, and quiz. The material was interesting and understandable because the information was not only in the form of written text. According to Widiyatmoko (2012), Sholikhakh et al. (2012), and Arda et al. (2015), science learning process with interactive media was better that conventional learning. It was also able to improve the concept mastery and learning interest. All features of the application could be downloaded on Google Store or Playstore. After that the user could install them on the smart phone, and use all the features without print them out. It indicates that the implementation of Science Mobile Learning application reduce the use of paper (paperless), so that the learning process becomes one of the conservation implementations in learning.

The Users' Responses towards the Implementation of Science Mobile Learning with Conservation Vision Application

Based on the validity data, the users said that the product was proper and valid. The validity test was conducted on two aspects, such as the product and its effectiveness for the users. The result of validity test by the users is shown in Table 4.

Table 4. The Result of Validity Test by the Users

No	Variable	Percentage	Criterion
1	Product	92.40	Very Good
2	Effectiveness of the Product	84.88	Good

The responses on the product by the users (students) are 92.40%, and the responses on the effectiveness of the product are 84.88%. The average percentage of both aspects is 88.51% which categorized as very good, so that the Android-based science mobile learning product is considered proper to support the learning process. Based on the result of validity test by the users (students), Android-based science mobile learning has an interesting display, is able to solve abstract material (needs visualization), and improves the learning interest especially on eclipse phenomenon material (the presented material).

CONCLUSION

It can be concluded that an application of science mobile learning with conservation vision which is proper to be used in science concept learning and supports paperless action has been created. It gains a good response from the users related to its easy access, the conformity of the features with the science content, and its utilization that supports paperless action.

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