Design of interactive multimedia mobile learning base on Android operating system for Biology subjects

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Abstract. This development discusses multimedia interactive mobile learning by using mobile-based learning. In developing for design this mobile application using the media development model by William W. Lee & Diana L. called ADDIE. The development phase consists of Analysis, Design, Development, Implementation, Evaluation. For appropriateness products, the product passes through the Alpha test stage which is validation conducted by the Material Expert and Media Expert, then revise the product according to the experts’ revision and recommendations. Furthermore, the product is implemented to 60 students of Class XI Science in Senior High School as the target user. Alpha test results show that the interactive multimedia mobile learning product is possible to use as a media learning.

1. Introduction

As time goes by, technology is needed for the lives of every human being. Even in the world of education, technology has a very important role to meet the needs of learning. Technological advances make things easier and more effective. In learning, the use of media becomes a very important part and is generally used as a learning tool. However, there are still many who do not know yet even use interactive media in learning, whereas when viewed in terms of needs, interactive media can train students’ independence in the learning process. Students can also have good experience in using media as a learning tool. Multimedia Interactive Learning not only trains student independence but also motivates students and stimulates students to want to learn.

Mayer explained in his article, do students enjoy using mobile technology? Some interesting findings are that students generally enjoyed using the technology and students’ level of enjoyment of using the technology was correlated with perceived success of learning [1]. As there was no measure of learning outcome, it is not possible to determine whether using the app caused improvements in learning outcome.

In some statement of the problem, the use of multimedia in education offers a tool that has the potential to change some of the existing educational methods, in order to prepare students for the information age [2]. Contended that multimedia can drive a shift from a traditional instructional approach toward a more eclectic set of learning activities that include knowledge building situations for students.

Interactive multimedia can be used to improve good understanding in order to improve the ability of students to solve problems in science [3]. Interactive multimedia is one of the learning media which is widely used by education practitioners in the learning process. Multimedia can provide material
visualization in the form of text, images, animation, audio, and videos. As a result, the materials can be communicated clearly to students [4]. Learning process using multimedia is very interesting, fun, and effective [5]. Information and knowledge packed in multimedia learning are very contextual. It makes students responses full of enthusiasm when learning is taking place.

The use of multimedia elements in making learning content becomes an important component in learning, because it gives students an alternative means to have more choices when learning in a student-centered environment [6]. Teaching listening skills by using interactive multimedia learning materials that have been designed and developed with the Wondershare Quizcreator program are very effective [7]. The effectiveness refers to the achievement of expected outcomes. They concluded that the interactive multimedia learning materials using Wondershare Quizcreator are effectively used in teaching listening skills.

The development of mobile learning in research practice as a modern learning style. Initially teacher centered but now student centered. In the classroom, mobile learning plays an important role in improving the learning process. The results of his research show that cellular technology plays an important role in education. The researcher concluded that mobile learning as a modern learning style can improve academic achievement among students and teachers [8].

This paper discusses the development design of Interactive Multimedia Mobile Learning base on Android Operating System. This development is expected to be able to produce a learning application for use by students in the classroom or outside in independent learning.

2. Methodology

2.1. Research procedure

This research uses the Research and Development (R & D) method. The purpose of this research is to develop interactive mobile learning multimedia learning products for Biology subjects for students of class XI Science in Senior High School 1 Dumoga. The development model used in this research is the ADDIE learning media development model which includes Analysis, Design, Development, Implementation, and Evaluation [9].

The research process is as follows: (1) Analysis; analyze and collect material and what needs are needed by students related to learning. (2) Design; sketching is formed in the storyboard, then flowchart to determine the course of the application. (3) Development; collecting material includes learning material, pictures, videos and audio that will be used to design the product. (4) Implementation; test multimedia learning to users in the field or students. (5) Evaluation; data analysis of the results of assessments from material experts, media experts, and students.

![Figure 1. Structure of ADDIE.](image)

2.2. Research subjects

Multimedia Design Interactive Mobile learning based on Android operating system, material and media validators, and students.
2.3 Data collection techniques and instruments
This study uses techniques and data collection in the form of observation, questionnaires, eligibility questionnaires from material and media experts.

2.4 Data analysis techniques
This type of research is qualitative and quantitative data and then analyzed with descriptive statistics. The results of the qualitative data in the form of positive and constructive comments and suggestions from material and media experts. The results of quantitative data were obtained from material experts and media experts.

Assessment in media expert instruments and material experts (questionnaire) is converted into an assessment score. Can be seen in table 1.

| Category                  | Score |
|---------------------------|-------|
| Very Less (VG)            | 1     |
| Less (L)                  | 2     |
| Good (G)                  | 3     |
| Very Good (VG)            | 4     |

After calculating the score in each then total the total score in one item divided by the ideal score for all items multiplied by 100%. Mathematically written as follows:

\[
Final\ Score = \frac{\sum \text{scores obtained by researchers}}{\sum \text{ideal score of all items}} \times 100\%
\]  

The division of eligibility categories by taking into account the range of percentage numbers. The 100% eligibility percentage is divided equally into five categories according to the Likert scale. Eligibility scores are categorized using the Eligibility Percentage Interval.

| Percentage Interval | Value             |
|---------------------|-------------------|
| < 21%               | Very Inappropriate|
| 21% - 40%           | Not Inappropriate  |
| 41% - 60%           | Average           |
| 61% - 80%           | Feasible          |
| 81% - 100%          | Very Feasible     |

3. Results and discussion
The results of this study are a product in the form of a multimedia learning mobile application used in Biology subjects in class XI.

3.1 Product development results

3.1.1 Analysis. After making observations by distributing needs analysis sheets, the authors found that almost all students needed learning media using their smartphones. Therefore, the authors designed multimedia interactive learning using cellular so that it can be used on their smartphones.

3.1.2 Design. At this stage it starts with designing learning materials, making flowcharts, and making storyboards, and gathering materials. The purpose of this stage is to facilitate researchers in developing products to be more structured.
There are 12 principles used by researchers to design multimedia interactive learning mobile learning. The principles are: (1) Coherence Principle, (2) Signaling Principle, (3) Redundancy Principle, (4) Spatial Contiguity Principle, (5) Segmenting Principle, (7) Pre-training Principle, (8) Modality Principle, (9) Multimedia Principle, (10) Personalization Principle, (11) Voice Principle, and (12) Image Principle [10].

3.1.3. Development. This product uses Indonesian Language. The results of the process of making interactive learning multimedia on Plant Network Structure and Function material namely, in the application there is a title page and the next page there are 5 main menus: (1) Instructions, (2) Materials, (3) Quizzes, (4) Games, (5) About (contains developer profiles). The "Directions" page contains instructions and uses for the buttons. On the page "Material" contains an introduction to the material and then divided into several buttons to sub-material. The "Quis" page contains practice exercises to hone students' ability to absorb material. Next on the "Game" page contains educational games to process students' memories in determining the parts of the plant structure. Finally, the "About" page contains the product developer profile.

![Figure 2. Title page or application title.](image)

![Figure 3. Menu Page for go to material content etc.](image)

This product was developed using Adobe Flash Professional CS6 tools. Once developed, this product is produced with ".apk" output to run on smartphone devices in the Android system.

After the media development has been completed, an alpha test phase is carried out in the form of material validation and media validation. This stage is used to see whether the material and media developed are feasible to be applied to students. There are two aspects in assessing the feasibility of the material aspects and aspects of learning. The results of the assessment of material experts are an average
of 90%, and the results of the assessment of material experts obtain an average of 98.75% and are categorized as Very Eligible to be used in application to students. Here is a table of the results of the assessment of material experts and media experts.

| Aspect    | Percentage Eligibility | Category     |
|-----------|------------------------|--------------|
| Material  | 95%                    | Very Feasible|
| Learning  | 85%                    | Very Feasible|
| Average   | 90%                    | Very Feasible|

Table 4. Results of expert media assessment.

| Aspect                  | Percentage Eligibility | Category     |
|-------------------------|------------------------|--------------|
| Screen                  | 100%                   | Very Feasible|
| Media Audio Video       | 95%                    | Very Feasible|
| Navigation              | 100%                   | Very Feasible|
| Product Endurance       | 100%                   | Very Feasible|
| Average                 | 98.75%                 | Very Feasible|

3.1.4. Application. After officially accepting the feasibility of the product from the experts, the next stage is product implementation. The implementation of beta testing was carried out on class XI Science in Senior High School 1 Dumoga. Researchers give directly to users for their use as teaching material to assist the learning process of teachers.

3.1.5. Evaluation. Researchers evaluate by analyzing data obtained from research results. All data from material experts, media, and application reviews from each student (user).

4. Conclusions
In conclusion, Interactive Multimedia Learning mobile learning has been developed according to the basic ADDIE development model which consists of 5 Stages: Analysis, Design, Development, Implementation, and Evaluation. The final product of learning media is in the form of a file with an .apk extension that can be used on smartphone devices with the default Android OS version 4 to 8. Using the foundation of 12 Principles from Mayer: (1) Coherence Principle, (2) Signaling Principle, (3) Redundancy Principle, (4) Spatial Contiguity Principle, (5) Segmenting Principle, (7) Pre-training Principle, (8) Modality Principle, (9) Multimedia Principle, (10) Personalization Principle, (11) Voice Principle, and (12) Image Principle, this product can be successfully developed. The results of the product feasibility test through alpha testing are very feasible. The use of interactive learning multimedia meets the standard of eligibility to target users or students. Students are able to use applications easily and help learning in the classroom and outside the classroom.

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