Android based e-learning tutorial for mathematics teachers

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Abstract. A large number of teachers and the scattered location due to geography condition is one of the causes the slow process of teacher training in Indonesia. The current national curriculum (Kurikulum-13) had been launched in 2013 but the implementation of the curriculum has the problem in socialization as well as teacher training in using this curriculum. This development research produces android- based E-tutorial material of the K-13 Curriculum Implementation for Mathematics Subjects that can be used by Mathematics teachers. The product contains of the curriculum K-13, the Competency analysis, design Lesson Plan and design Evaluation for the knowledge and skills aspect as well as video using a scientific approach in Problem Based Learning and of Discovery Learning Model. This e-tutorial is developed by using Waterfall method and used android based. The product has been used by mathematics teachers for testing product practicality. The product is assessed based on the aspect of cosmetics and program. The product then revised based on input from the teacher. The average score on program aspect is 3.8 and 3.5 on aspect of cosmetics. Therefore, the results of this study will be one of the solutions for preparing teachers to implement the curriculum.

1. Introduction

The 2013 curriculum focuses on the acquisition of contextual knowledge related to the subjects and its learning environment. The curriculum seeks to develop students’ skills in three areas: attitude (honesty, politeness, and discipline), technical skills (through practical work/school projects), and scientific knowledge. At the elementary level, the curriculum emphasizes on the development of attitudes and functional skills over scientific knowledge, which receives more attention at higher educational levels. At the junior and senior high school levels, the academic rigor is increased since the students’ personalities were emphasized at the primary level [1].

The curriculum has been implemented nationally at the beginning of the 2013-2014 academic year. In the first year of the implementation, the curriculum was only implemented nationally in grade 1, 4, 7, and 10. The government has conducted various training for teachers, however, not all teachers have understood this curriculum well [2]. Many teachers who are appointed as curriculum implementers feel not ready to implement this curriculum. As a result, they still use the previous curriculum in their teaching. Teachers encounter various problems in implementing the curriculum including: preparing learning media, integrating lessons in thematic learning, and mastery of information technology [3]. Teacher training is very important to note because teachers play an important role in the process of curriculum implementation [4]. Nurmalasari [5] said the role of teachers in the implementation of current Curriculum, namely: a) teachers discuss in the process of preparing lesson plan; b) teachers prepare lesson plan; c) teachers deliver the lesson d) teachers as facilitators; e) teachers provide
character education; f) teachers guide students according to a scientific approach; g) teachers choose and use varied methods, media, and learning resources, h) teachers perform authentic assessments; i) teachers choose and use varying assessment techniques; and j) teachers provide remedial teaching.

The current curriculum is an improvement from the previous curriculum with an addition to some aspects of implementation. For the implementation of the curriculum of 2013, students' books and teachers' books are provided by the central government as compulsory learning resources in schools. Teachers' books and government-provided student books are designed for national purposes, teachers need to be aware of them in order to adapt to the characteristics of each school.

To maximize the implementation of the 2013 curriculum every year the government revises both the content and the socialization process to prepare teachers using the 2013 curriculum. The government is targeting that by 2019 all teachers are ready to learn using this curriculum. The new problem that arises is the way of socialization for all teachers who spread throughout the territory of Indonesia with very varied geography conditions.

In the previous year, researchers have developed a desktop-based e-tutorial, teachers can use this material if they get the file directly from the researchers or get files from colleagues. However, when the government revises the contents of the curriculum and other tools the teacher cannot access the revised results directly from the revised e-tutorial. To overcome these problems researchers developed a desktop-based e-tutorial into an android-based e-tutorial. Android is an open-source, Linux-based operating system for mobile devices such as smartphones and tablet computers [6]. By using android based e-tutorials every researcher to upgrade the contents of the program so the user e-tutorial teachers can upgrade their materials. Seppala [7] found that e-tutorial as flexible teaching solutions, which will enable access to information using different devices, and support learning in a variety of situations.

The aim of this research is to produce the android-based e-tutorial on the implementation of curriculum 2013 for mathematics teachers. Setiabudi [8] said android based learning is contributing to every day learning more people are able to access the program to complete their education. This research is useful for junior and senior high school mathematics teachers in preparing the implementation of the 2013 curriculum. Teachers can learn this product themselves without the help of instructors. This product is also useful for resource persons and Instructors of the 2013 curriculum to be used for material in the 2013 curriculum training for targeted teachers. Overall, this e-tutorial is useful for the government, especially the education offices at various levels to facilitate the implementation of the 2013 curriculum so that the curriculum can be fully implemented in 2019.

2. Methodology

The research activities at the design stage and develop activities was focus on the design and development of the Android-based Curriculum E-Tutorial system 2013. System development method used was Waterfall method. The Waterfall Model was the first Process Model to be introduced. It is also referred to as a linear-sequential life cycle model. It is very simple to understand and use [9]. Wells [10] said development is discrete, and do not allow for jumping back and forth, or any overlap between the phases. The steps in Waterfall can be seen in Figure 1.

![Figure 1. Waterfall method](image-url)
The waterfall method is often called the classic life cycle, which illustrates a systematic and sequential approach to software development, starting with the user needs specification and continuing through the planning, modelling, (construction), as well as delivery of the system to the customers/users (deployment), which ends with support in the complete software generated. Stages of activity can be seen in the following description:

Requirements definition, at this stage the needs analysis process is intensified and focused on software. The first step is to identify the nature of the program to be created, and then the software engineer must understand about the information domain of the software, such as required functions, user interface, and user character. The three activities (search system and software needs) were documented and shown to customers. Needs are collected by interviews, field surveys, questionnaires, and surveys.

System and Software Design process is used to transform the above needs into a representation into the "blueprint" of the software before the coding. The design should be able to implement the requirements already mentioned in the previous stage. On the stage of Implementation and Unit Testing, to be understood by the machine, in this case is the computer, the design had to be transformed into a real form and can be understood by the machine, that is into the programming language through the process of coding. This stage is an implementation of the design stage that technically will be done by the programmer. Integration and system testing are done to ensure that a product must be tested. Likewise with software, all software functions should be tested, so that the software is free from errors, and the results should be perfectly in accordance with the needs that have been defined previously. Operation and maintenance of software is conducted including in its development, because the software need to be revised periodically.

Data collected in this research is a training material published by the government for teacher training in implementation of curriculum 2013 such as guideline for designing lesson plan, evaluation and various learning model. Some of these materials are used as they are, but most of them are edited into difference appearance. Other data used for this e-tutorial product are the teachers’ and students’ books uses for mathematics learning of year 7 up to class 12. An instructional instrument such as lesson plan, student worksheet, evaluation instrument are developed by researcher and revise based on the result of validation by 20 mathematics teachers. Those teachers are members of the mathematics teacher group from Regency of Siak. They were given a questionnaire for assessing the product based on the aspects of program and cosmetics.

3. Results and Discussion

In the previous year, researchers have developed a desktop-based e-tutorial, teachers can use this material if they get the file directly from the researchers or get files from colleagues. However, when the government revises the contents of the curriculum and other tools the teacher cannot access the revised results directly from the revised e-tutorial. To overcome these problems researchers developed a desktop-based e-tutorial into an android-based e-tutorial. By using android based e-tutorials every researcher to upgrade the contents of the program so the user e-tutorial teachers can upgrade their materials. E-learning expect will promote more efficient learning technique [11].

The first result of the research proses is the navigation structure of the program. The e-tutorial program consists of 7 part of information, they are the introduction, the dynamics of curriculum development, teaching material, instructional instrument, learning assessment, implementation of curriculum 2013 and related government regulation. The user can surf into the program through those seven choices of the main menu as shown in Figure 2.
This e-tutorial product uses android hybrid application. This app utilizes Webview as the main component. The framework used is Phonegap. The product design can be seen in Figure 3 and Figure 4:

The prototype of android-based e-tutorials was tested to the group of junior high and high school teachers who are members of Mathematics Teachers Group Discussion (MGMP) Mathematics. Programs are given to teachers to be learned and they are given a questionnaire for assessment and feedback on the program. Assessment is given for two aspects they are program and cosmetic aspects. Assessments of the program aspects are presented in Figure 4:
Figure 5. The average assessment score on program aspect

The picture above shows the average score of the six points questioned on the program aspect. All aspects get very good scores on a 1-4 scale, all above 3.7. The best scores are given on the layout of the image, text and interactive buttons used in the program. The lowest scores are given on the ease of using the program, this is considered reasonable as they are the first to use the given program. Scoring assessment for cosmetic aspects is presented in Figure 5.

Figure 6. The average score of assessment on cosmetics aspect

From the figure above can be seen there are seven things that are questioned on the cosmetic aspect, this is to ensure that the program appears attractive and fun to read. The best judgment is given on typing points, almost no typos found in the created program, but there are some differences in the writing style so it does not get the full score. The points that get the lowest score are about the use of animation. Teachers expect to find more animation so it is more fun to use the program. For the use of color, some of the input given is for the program to use a brighter color, so more uplifting to learn.

4. Conclusion
Implement e-tutorial can be used as an alternative method in the learning process or training. The results show that the use of android based e-tutorials increases the mastery of knowledge and teachers consider learning more fun, faster and easier than traditional tutorials. The advantages of android based e-tutorials because it can be accessed anywhere and anytime, thus increasing participants' control of learning. This new e-tutorial contains two examples of learning models, so there is still an opportunity to develop examples of other learning models for different levels of school.

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