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Interactive Learning Media Based on Android for Computer Programming Course

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Abstract. Computer Programming is one of the basic compulsory subjects for the electrical engineering field. This subject needs continuous practice so that it can be mastered well. This study aims to develop an interactive learning media based on Android so that students can practice anywhere. The interactive learning media for computer programming course takes in explanation of operator c++, input-output statement, program structure, data type, condition, repetition, string, and array, complemented with evaluation facility using the cosine similarity method so that the automated essay scoring feature is available. Interactive features provided in this learning media are the auto complete syntax and function in the code editor. For the evaluation used the black box testing method to test the functionality of the android application and the distribution of questionnaire to determine the response of students. The responses of student have proven that the level of practicality of this interactive learning media is 87.5%.

1. Introduction

The development of technology in education is very fast. The demand for quality learning outcomes is a correlation of technological consequences. Ranging from conventional learning models to computerized learning models. The presence of computerized media will be very helpful in teaching and learning [1]. In the university lecturers are expected to be able to transfer their knowledge to students well.

Android-based learning media is one of the most popular information technology media in the world of education this time. The transfer of knowledge can be carried out well through this media because of the ease of interacting between lecturers and students. The interaction is that the lecturer gives some learning materials complemented with evaluation in the form of student essay questions and answers based on the skills they have. The essay in question is an essay in Indonesian which has many variations of affixes. The Automatic Essay Score (AES) feature was added to the e-learning function as a final grade student so that the lecturer could streamline time and energy to check student essay answers [2].

Sixties years last century, researches conducted research on AES [3]. It loses about 30 billion pounds per year just because the teachers in Britain spending their 30% time for scoring student's answers about 30% [4]. By implementing AES, it's hoped that teaching staff will not spend much time examining the work of their students.



There are many kinds of method that support AES. The previous research [5] reveals that Cosine Similarity Method has a better server performance so that preferred to be implemented in e-learning automatic scoring system. In this research, to support the AES feature Cosine Similarity method is used in this design of the learning media.

The Cosine Similarity method [6] is a method used to measure the similarity between two different text or documents by measuring the cosine of the angle between the document representation vectors. The cosine value is between 0 and 1 where the greater value of cosine, the greater its similarity between the two sentences or documents that being compared. This method aims to equalize the two sentences in a document that will be compared, then the results of the comparison will be used as similarity values.

Cosine similarity is a measure of similarity more commonly used in information retrieval and is a measure of the angle between the document vector D_a (point (a_x, b_x)) and D_b (point (a_y, b_y)). Each vector represents each word in each document (text) that is compared and forms a triangle, so that the cosine law can be applied to state that:

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab} \quad (1)$$

where

$$a^2 = a_x^2 + a_y^2; b^2 = b_x^2 + b_y^2 \quad (2)$$

and

$$c^2 = (b_x - a_x)^2 + (a_y - b_y)^2 \quad (3)$$

Substituting the above equation values for a, b and c, so that they are obtained

$$\cos C = \frac{[a_x b_x + a_y b_y]}{[\sqrt{a_x^2 + a_y^2}]^{1/2} \times [\sqrt{b_x^2 + b_y^2}]^{1/2}}$$

when two documents are identical, the angle is zero degrees (0°) and the similarity is one (1); and when the two documents are not identical at all, the angle is 90 degrees (90°) and the same is (0) [7].

Computer Programming is one of the basic courses with 2 credits found in the curriculum of Electrical Engineering Study Program at Universitas Hasanuddin. This course is intended to provide knowledge and understanding of how to make computer programs using programming languages to solve problems in various fields of life. The programming language used in this course is C++. Currently the lecture process is more often done in the classroom so that students are limited in doing programming activities directly, while in order to understand the material all students should immediately be able to practice it. To overcome this, an interactive learning media for computer programming course is created which is complemented with evaluation/assignment facility. This application is based on Android but also can be accessed via website.

2. Research Method

The development of this research is in accordance with the R&D method (Research and Development). R&D is a research method used to produce certain products and test the effectiveness of these methods. In education, R&D is a research method used to develop or validate products used in education and learning [8]. This research used R&D with the following steps:

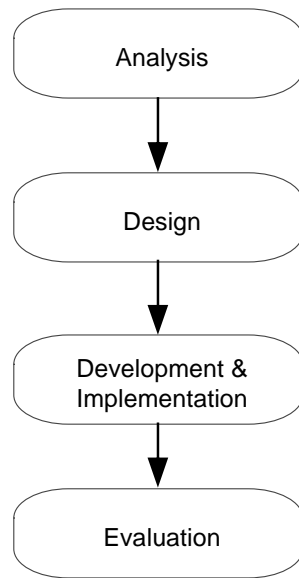


Figure 1. Stages of development and research

- *Analysis* – covering problem, need, and task identification.
- *Design* – covering data design for material and problem needs, navigation design, user interface design, and algorithm.
- *Develop* – covering making learning media using Android Studio, HeidiSQL, and Rational Rose.
- *Implementation* – in the form of a learning media—android application, that can be accessed using computer and android smartphone.
- *Evaluate* – user response assessments were conducted by students.

The research site was conducted at the Computer and Network Laboratory of the Department of Electrical Engineering, Faculty of Engineering, Universitas Hasanuddin at the Gowa Campus. For the evaluation used the black box testing method to test the functionality of the android application and the distribution of questionnaires to determine the response of students. Data collection tools used by using a questionnaire instrument. Context diagram for interactive media learning shown in Figure 2.

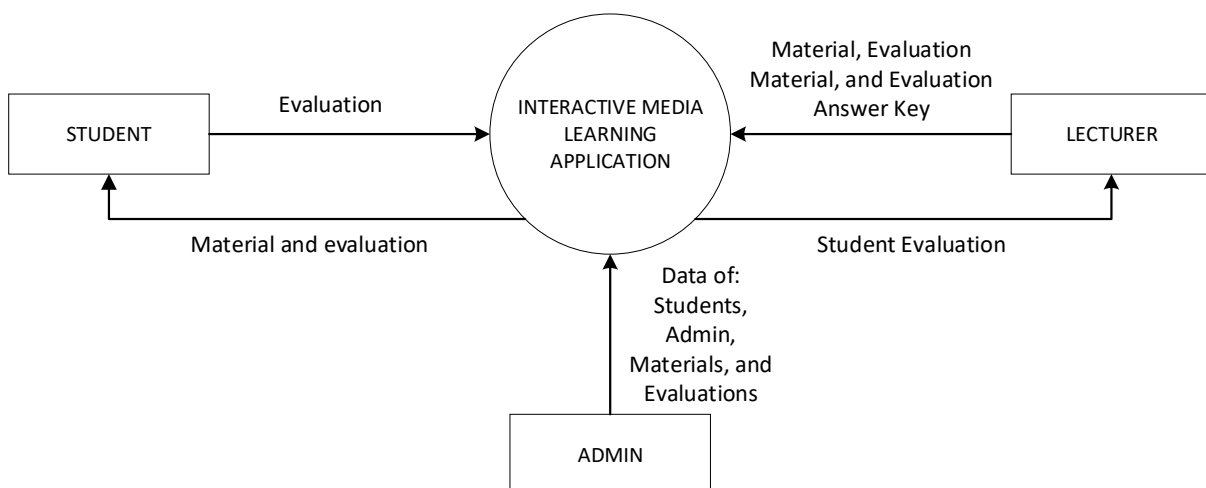


Figure 2. Interactive media learning for computer programming course context diagram

3. Results and Discussion

From the results of the system design that has been carried out, an interactive learning media is produced with an automatic assessment feature for essay answers and auto complete syntax and function in the code editor. The main parts of this research are as follows.

3.1. Lecturer Page

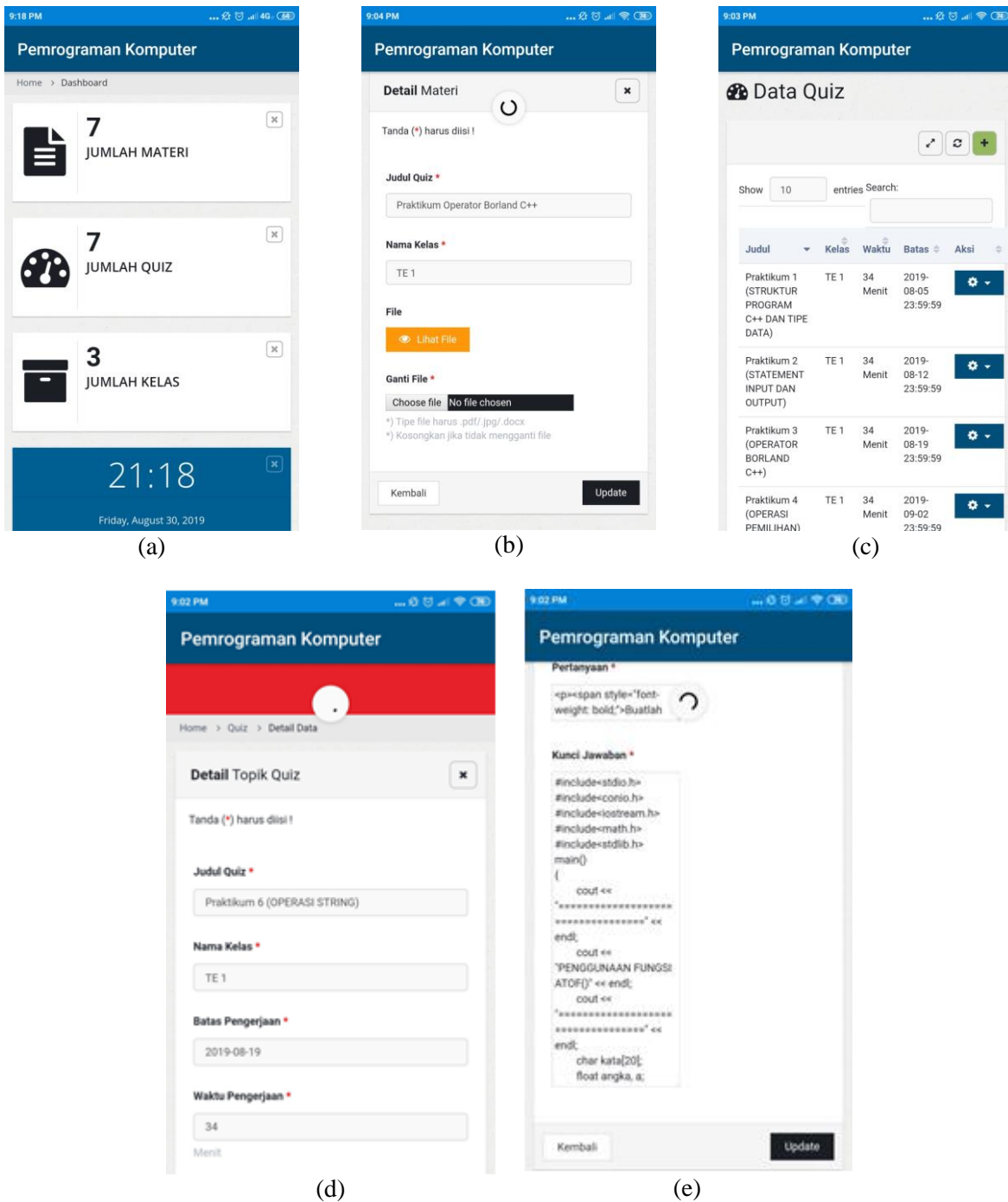


Figure 3. Lecturer result pages (a) Lecture menu page (b) Lecture learning material page (c) List evaluation/quiz page (d) Create evaluation/quiz page (e) Detail create evaluation/quiz page

3.2. Student Page

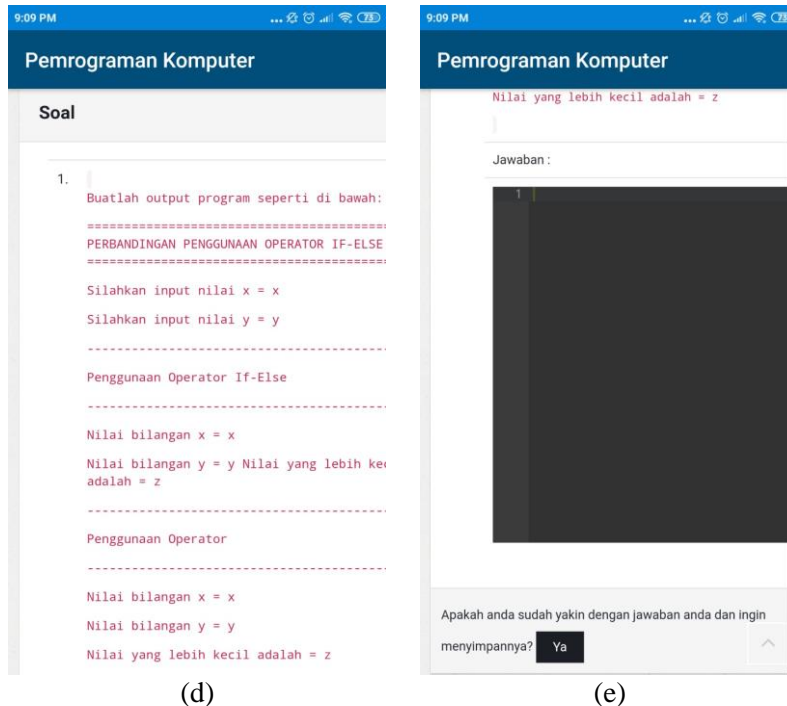
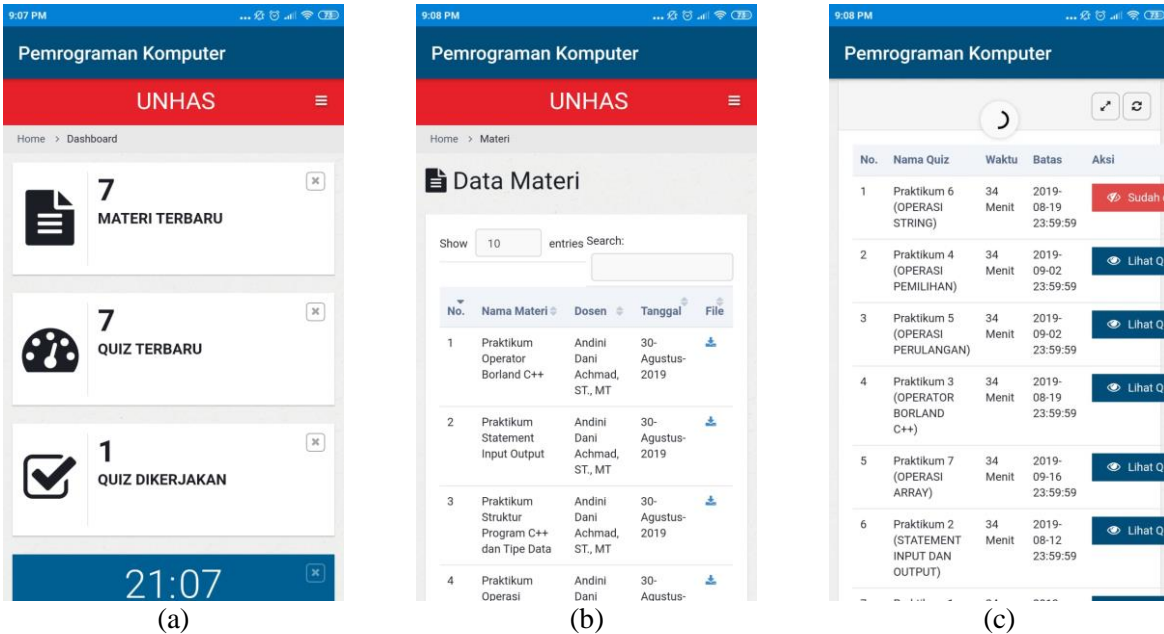


Figure 4. Student result pages (a) Student menu page (b) Student learning material page (c) List evaluation/quiz page (d) Quiz page, display problem (e) Quiz page, display answer editor

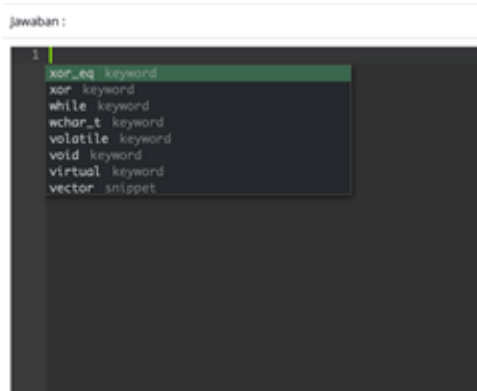


Figure 5. Interactive features, auto complete syntax and function in the code editor

Not all students have laptop at the time of learning as well as its prices relatively expensive. But most students use mobile phones based on Android. After the implementation and testing the application by filling out the questionnaire, the results show that 87.5% agree that the development of an interactive learning media based on Android is practical and can help students to understand the learning material.

4. Conclusions

Based on the research results obtained, it can be concluded that the interactive learning media based on Android can be used as a practical learning media to help students to understand learning material more which is equipped with interactive feature; auto complete syntax and function in the code editor. This application can also assist lecturers in directly monitoring the results of student evaluation during lecture time because it equipped with AES feature using cosine similarity method.

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