



Inquiry Model Utilization on Android-Based Learning Media

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Abstract. The transformation of education in Indonesia requires various components of education to work together in the intellectual life of the nation. Lecturers are one of the determinants and implementers of education that are proclaimed by the government. Thus, it can be concluded that lecturers have a central role in the educational process at the university level. The media development model used in this study uses the Waterfall development model. This model takes a systematic and sequential approach. This research is included in the type of pre-experimental research using a one group pre-test post-test design with random sampling. The dependent variable in this study is student learning outcomes, the independent variable in this study is learning with conventional methods and learning using inquiry-based learning media, and the moderator variable in this study is student learning motivation. There is a significant difference between student learning outcomes using inquiry-based learning media and conventional learning media. This is very evident in low achieving students where learning using inquiry-based media greatly facilitates them to get learning outcomes that are almost equal to high achieving students.

Keywords: Inquiry-Based · Learning Media · Learning Outcome · Conventional · Motivation

1 Introduction

Post-COVID19 learning requires lecturers to use learning media that are able to help the teaching and learning process become more meaningful and able to expand the information obtained by students so that the planned learning objectives will be fulfilled. Learning media is also a medium of information on teaching and learning activities that are able to provide effectiveness and interactivity in the learning process. So, interactive learning media can be more effective and efficient to use in the learning process. Learning media that use only one medium is called interactive media, whereas if it uses more than one media, such as images, audio, video, animation, and graphics, it is called interactive multimedia.

The search and find approach is emphasized in the inquiry learning technique instead than being supplied directly. In this approach, students' roles are to research and discover

the subject matter on their own, with the instructor serving as a facilitator and guide for students to learn. The inquiry learning technique might consist of a number of educational activities that place an emphasis on using critical and analytical thinking to seek out and discover solutions to a problem. Sometimes, professors and students would exchange questions and replies to impart the thinking process itself. This learning technique is sometimes referred to as a heuristic technique, which originates from the Greek word "heuriskein," which means "I find." [1]. The inquiry strategy places a strong emphasis on encouraging active learning from students. This implies that the inquiry technique treats students as the objects of learning. Students participate in the learning process by both listening to the teacher explain concepts orally and actively seeking out the essence of the subject at hand [2].

A set of learning exercises known as the inquiry learning method place an emphasis on the process of using critical and analytical thinking to look for and identify solutions to problems. Typically, professors and students would exchange questions and responses to facilitate the thinking process. According to the constructivist perspective, reality only exists in one's thinking. The focus of constructivism is on how a person creates knowledge from his or her experiences, mental models, and beliefs in order to interpret things and occurrences [3]. Inquiry involves a more developed version of the discovery process [4], and higher-level cognitive processes in addition to discovery, such as problem-solving, experiment design and execution, data collection and analysis, and conclusion-drawing. It also promotes objectivity, honesty, curiosity, and openness. [5].

Media is a tool used to support learning so that learning can run effectively and learning materials can be understood by students. Media can also be interpreted as a liaison between the giver and recipient of information. The use of media as a liaison between educators and students so that students learn actively requires media support to convey the material to be studied [6]. The learning process not only conveys information and knowledge through lecturers to students, but also seeks students to learn and think creatively, because the main purpose of learning is for students to be able to solve complex problems using the knowledge that has been given [7]. So that learning is a process of interaction between educators and students as well as learning resources and media used, in an effort to change the cognitive, affective and motoric aspects. So that the learning process becomes easier for students to understand, educators need to develop effective learning media that requires students to think creatively and attract attention. Effective learning media is the use of communication tools used to convey targeted information from sources to students in a structured manner so as to enable the creation of a teaching and learning process that requires students to think creatively in solving problems. Learning media also utilizes technology to interact with each other between teachers and students in addition to physical means to deliver subject matter [8].

In essence, including learning media into the teaching and learning process helps spark students' curiosity and motivation to study. However, if the media used in the learning process is always monotonous, the teaching and learning process will not go well. Moreover, the current learning phenomenon makes teachers have to always think creatively in compiling learning media to attract students' interest in learning. The use of digital multimedia technology to provide learning content that is in accordance with learning objectives in the form of text, animation, video and the use of games in the

learning evaluation process is one example of interactive learning media. The use of these products is expected to be able to assist students in increasing motivation, exploration and students' understanding of the material taught by the teacher.

Universities in Indonesia have implemented the "Merdeka Belajar" curriculum where one of the learning processes is student-centered, although the implementation is not yet fully student-centered. In the learning process, lecturers still tend to use the traditional lecture method. Where the lecturer conveys the learning material through the process of explanation and verbal narration to his students. The learning process is centered on lecturers and students are still dependent on lecturers, so students become inactive. In addition, students often do other activities on their own during each lesson, so the class conditions become less conducive.

The transformation of education in Indonesia requires various components of education to work together in the intellectual life of the nation. Lecturers are one of the determinants and implementers of education that are proclaimed by the government. Thus, it can be concluded that lecturers have a central role in the educational process at the university level.

Based on the problems above, the researchers found several things that must be improved in the learning process for Computer and Basic Network subjects, namely the use of learning resources, student activity, willingness to cooperate between students, communication skills between students and lecturers and less effective lesson hours. And the method of delivery in carrying out learning process activities is still not optimal.

2 Research Methods

This research was conducted at Universitas Negeri Medan in Program Studi Pendidikan Teknik Elektro. Respondents who act as media assessors are media experts, subject experts, and 37 students as learning media users. The android-based media development model implemented in this study uses the Waterfall approach, researchers use this approach because it is proven that this approach is very suitable for developing learning media because it is very systematic and sequential.

1) Requirements Analysis

In developing the features that will be provided on learning media, the research team collects user requirements data through interviews and direct discussions with prospective media users. The information is analyzed to obtain data needed by users so that the media developed will be right on target.

2) Media Design

This process focuses on the development of the user interface and user experience, the design of internal and external functions, as well as the details of each procedural algorithm using storyboards, which will later become the basis for programmers to code the application.

3) Implementation

At this stage the programmer uses the Java programming language using Android Studio. This programming process refers to all the features that have been obtained from the previous needs analysis. At this stage, the system is first developed in a

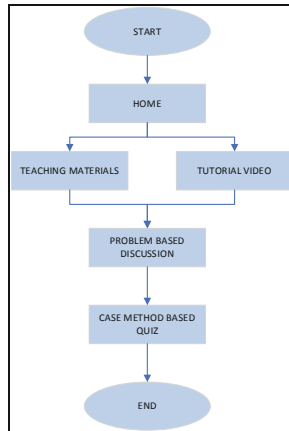


Fig. 1. Learning media flowchart

small program called a unit to minimize the occurrence of bugs/errors in the learning media and will facilitate the integration process at a later stage.

4) **Verification**

The verification stage includes system integration and also testing the applications that have been made. When this stage is done, generally QA, beta testers, and an expert will test the learning media will find various problems in the application that must be resolved, and will report the problems obtained in this stage. At this stage, all modules and features that have been created will be combined and then tested whether they are in accordance with the specified specifications or there are errors in the system before being repaired again.

5) **Maintenance**

After verifying, the media that has been created will be rechecked, including fixing errors that were not found in the previous step, including the media installation process in the form of apk files and direct application testing. Maintenance is also a form of responsibility of the development team to ensure the application can run smoothly after being handed over to the client within a certain period of time.

The flowchart of the learning media can be seen in Fig. 1, the learning media created using Waterfall is based on the inquiry model, where the initial stage of students accessing learning materials (orientation), then applying the theory they have learned in solving case problems.

This research is included in the type of pre-experimental research using a one group pre-test post-test design with random sampling. In one of the group pre-test post-test design, the independent variables of the study were conditioned in such a way that they were given as pre-test and post-test. The sampling technique used in this research is purposive sampling, which is a sampling technique based on certain considerations.

The dependent variable in this study is student learning outcomes, the independent variable in this study is learning with conventional methods and learning using



Fig. 2. Research variables

Table 1. Media construction feasibility test

No	Aspects	Average Value	Category
1	Guide and information	4	Feasible
2	Program performance	4.13	Feasible
3	Systematics, Aesthetics & Design Principles	4.15	Feasible
Average result of all aspects		4.09	Feasible

inquiry-based learning media, and the moderator variable in this study is student learning motivation (Fig. 2).

In this study, two types of data analysis techniques were used, namely validity and reliability analysis techniques. Internal validity in this study uses two Expert. Validation questionnaires for media experts were used to obtain data on the feasibility of the developed media, validation questionnaires for material experts were used to obtain data on the feasibility of learning materials included in the media, validation questionnaires for users were used to obtain data on the feasibility of media developed from users, this method is adapted from Sriadhi [9].

3 Results and Discussion

The development of inquiry-based Interactive Learning Media aims to show the design of Interactive Learning Media products that are appropriate and feasible to be implemented for learning materials. The interactive learning media products that have been designed consist of several menus, namely lesson material, case-based quiz, core competencies and basic competencies, learning video, media usage instructions, and group discussion menus.

1) Media Feasibility Test Analysis

In analyzing the media feasibility test, the researchers conducted a feasibility test for media construction, a feasibility test for lesson content, and a user acceptability test which is shown in Table 1, 2, and 3.

Based on the results of the media feasibility test above, it can be concluded that the media construction feasibility test got a feasible result with a value of 4.09, the lesson content feasibility test got a very feasible result with a value of 4.63, and the user acceptability test got a very feasible result with a value of 4.75. This states that the media is suitable for use and N-Gain testing will be carried out next.

Table 2. Lesson content feasibility test

No	Aspects	Average Value	Category
1	Guide and information	4.85	Very feasible
2	Multimedia content	4.55	Very feasible
3	Evaluation	4.5	Very feasible
Average result of all aspects		4.63	Very feasible

Table 3. User acceptability test

No	Aspects	Average Value	Category
1	Guide and information	4.67	Very feasible
2	Multimedia content	4.95	Very feasible
3	Evaluation	4.58	Very feasible
4	Media design and feature	4.75	Very feasible
5	Pedagogical effect	4.82	Very feasible
Average result of all aspects		4.75	Very feasible

Table 4. Learning outcomes between inquiry-based learning media and conventional media

Test Statistics (Wilcoxon Signed Ranks Test)	
Posttest - Pretest	
Z (Based on negative ranks)	-3.576
Asymp. Sig. (2-tailed)	.000

2) Learning Outcomes Comparison between Inquiry-based Learning Media and the Conventional Media

From Table 4 shows that the value of $p = 0.000$, smaller than the value of $\alpha = 0.05$ so it can be concluded that there is a significant difference between the learning outcomes of students who use the inquiry-based learning media and the conventional model. This is supported by the data from descriptive analysis which states that the learning outcomes of students who use the inquiry-based learning media (average value = 86.41) are better than the learning outcomes of students who use the conventional learning media (mean value = 71.69).

The inquiry-based learning Media integrates the steps of the scientific method in the learning process. The steps of the systematic scientific method help students to understand the lecture material and store it properly into the student's cognitive structure both assimilation and accommodation. The inquiry model activates the role of students to construct their own knowledge through meaningful learning activities.

Table 5. Learning outcomes between inquiry-based learning media and conventional media for high achieving students

Test Statistics (Wilcoxon Signed Ranks Test)	
PostHigh - PreHigh	
Z (Based on negative ranks)	-2.052
Asymp. Sig. (2-tailed)	.029

When compared with the conventional learning media which tends to emphasize the learning process on the teacher in the knowledge construction process (teacher centered), the inquiry-based learning media tends to emphasize the independent activities of students in investigative activities.

3) Learning Outcomes Comparison Between Conventional Learning Media and Inquiry-Based Learning Media for High Achieving Students

From Table 5 shows that the results of the Wilcoxon Matched Pair Test analysis $p = 0.029$, smaller than $\alpha = 0.05$. It can be concluded that there are differences in learning outcomes between the conventional learning Media and the inquiry-based learning media for students with high achievement motivation. In this case, students who have high achievement motivation in the sample group have better learning outcomes than students in the control group.

Each learning media has a different effect on the learning outcomes of students who have high achievement motivation. Conventional learning media is not fully able to accommodate students who have high achievement motivation in the learning process. Conventional learning media minimizes student participation in active learning activities in constructing their knowledge. Learning media that can properly accommodate this is inquiry-based learning media. In this inquiry-based learning media, students will experience a series of meaningful learning processes in accordance with the scientific method. In this inquiry model, students are not only given the opportunity to actively participate in the learning process but also contribute in determining the results of learning activities to be achieved later.

4) Learning Outcomes Comparison Between Conventional Learning Media and Inquiry-Based Learning Media for Low Achieving Students

From Table 6 shows that the results of the Wilcoxon Matched Pair Test analysis $p = 0.018$, smaller than $\alpha = 0.05$. It can be concluded that there is a significant difference between inquiry-based learning Media and conventional learning media. In this case, students who have low achievement motivation in the treatment group have better learning outcomes than students in the control group.

Low achieving students are one of the problems that are generally encountered in the lecture process. Not all learning models can accommodate well to direct students who have low achievement motivation in order to achieve the lecture goals set previously. There are 2 aspects that underlie achievement motivation; hope for success, and avoid failure [10]. The success referred to in this achievement motivation is the desire to do more in accordance with the highest standards in the learning process, even though the conventional learning media has accommodated this aspect

Table 6. Learning outcomes between inquiry-based learning media and conventional media for low achieving students

Test Statistics (Wilcoxon Signed Ranks Test)	
PostLow - PreLow	
Z (Based on negative ranks)	−2.241
Asymp. Sig. (2-tailed)	.018

but to foster student courage in facing challenges and failures. This is caused by the low involvement of students during the learning process. On the other hand, students with low achievement motivation who use inquiry-based learning media are given the full opportunity to carry out investigations. This active participation will provide students with a learning experience on how to minimize failure during lectures. Furthermore, this will foster student confidence during the lecture process. Such learning motivation is an internal drive that is able to move students to improve their quality in the learning process.

4 Conclusion

There is a significant difference between student learning outcomes using inquiry-based learning media and conventional learning media. This is very evident in low achieving students where learning using inquiry-based media greatly facilitates them to get learning outcomes that are almost equal to high achieving students. In addition to motivational variables, other moderator variables that allow to be investigated in research using an inquiry model such as the level of intelligence (IQ), student anxiety level, and student cognitive style are also very important to study their impact on student learning outcomes. Further research is expected to develop learning media using project-based learning models. This is related to the use of learning media that requires students to participate actively and is also in accordance with the characteristics of project-based learning.

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