

Mobile Learning: Utilization of Media to Increase Student Learning Outcomes

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Abstract—The low learning outcomes of students from year to year in the department of informatics in the course of data structure affect the learning outcomes. The purpose of this research is to know the difference between Student Learning Result between Using Mobile Media Learning application with Conventional Learning. Using a Quasi-Experimental Design. The sampling technique used is Cluster Purposive Sampling. Samples were divided into two groups: experimental groups taught using media mobile learning apps, and control groups taught using conventional learning. The test result data were tested using the Shapiro-Wilk test to know the data normality, F test for data homogeneity, and t-test to know the difference of learning result value with significant level ($\alpha = 0.05$). Based on the data analysis result, a normality test result with the Shapiro-Wilk test obtained the value of both groups of samples is the normal distribution and the result of the F test is homogeneous. T-test result obtained by probability = 1.830 with $\alpha = 0.05$ so probability value $< \alpha = 0.05$ which means H_0 is rejected, hence there is the difference of result of student learning between using application of Mobile learning media with conventional learning.

Keywords—mobile learning, data structure, student, learning outcomes, quasi-experimental.

I. INTRODUCTION

Activity learning environment that goes on is not always the same condition, there is flowing, some are not flowing, there are students who quickly understand what is delivered lecturer, and there are also students who find it difficult to understand what the lecturer presented. Students have high learning motivation and some are difficult to concentrate, and have no motivation, this is often found in the process of teaching and learning.

The data structure is one of the courses that get more attention from the Computer Science Lecturer and students. because this course is a lot of students make a failure in learning [1-2]. Various approaches methods, strategies, pattern, and technologies have been used as a lecturer, but have not been able to be an appropriate solution to be generally applicable [1], [3].

According to [4] data structures is a substantially important foundation course in computer science for computer programming students on account of learning fundamentals of data structures and algorithmic approaches used in software design and development. Further, that

explained data structures is also important for students to have the ability and vision to design and develop fast, active and stable software [4].

In the learning process is very necessary for a lecturer to overcome student learning difficulties. one of the approaches is to develop a mobile learning media. In our previous research, we have designed an instructional framework that focuses on the visualization of content media theory-practice of data structures course [1] and has measured the availability of network and service quality for the application of mobile learning tools of the data structure course. Then, the measurement results become the benchmark in the design and development of online learning software. Data usage, material content, access speed and streaming of learning content [5].

This paper will discuss the effect of mobile media app usage on student learning outcomes. "Is there any influence of the media on student learning outcomes in the course of data structures?", The expected contribution of this research is to become informed about the importance of mobile learning media as one of the methods approaches, become the solution of student's learning difficulties will stimulate students' learning spirit to learn become an easy and fun thing, as improving the teaching and learning process to achieve optimal learning outcomes.

II. BACKGROUND AND RELATED WORK

A. Network Availability in East Kalimantan

In order to that the mobile learning process can run well online, the network availability at the location must be available because the successful implementation of the online learning system is largely determined by the availability of the network in the area where the application users live (student habitation). Related to this, in previous studies the author has reviewed the server performance issues and availability of existing networks in the Borneo area, we have also analyzed and discussed them in previous research, among others; the paper [6], the study was conducted using a mobile device and implemented in seven districts and four points in every district in the city of Samarinda, East Borneo. Measurements using the standard quality of TIPHON with some parameters such as end-to-end delay, jitter, packet loss probability and throughput.

Broadband quality of service experience measuring mobile networks from consumer perceived [7], this paper provides an overview of the quality of service experience from the viewpoint of the customer's perceived of mobile broadband services. Using a quantitative descriptive analysis of active testing a number of data packets were sent to the communication line to measure the six Quality of Service parameters using the LIRNEasia Benchmarking approach.

User perceptions of mobile internet services performance in Borneo [8], the study tries to assess the Quality of Service (QoS) for mobile internet services in the ways assessment involves identifying user perception to assess consumer experience of the mobile internet services they were using. A survey led to the gathering of important information on QoS for mobile internet, which has been analyzed further. The information from the survey pertains to the awareness levels among consumers regarding their data plans, overall satisfaction, Indonesia Telecommunication Regulatory Authority (BRTI) and its regulations on QoS.

The network performance measurement related to the content of the application has been discussed in the paper [9], the paper examines the availability of mobile networks and also develops mobile learning software. The app is then implemented directly in the mobile networks, performing measurement and performance testing on the parameter which is the quality of service metrics by internet service providers in locations of the research project. And the paper [10], discussion an availability of mobile networks and develops mobile learning software.

B. Mobile Learning App for Data Structure Course

Mobile Learning Applications that have been developed contain teaching materials in accordance with the syllabus of the Data Structure course, the material presented in the form of visual animation, along with code-script and theory on each content. The content of teaching materials refers to [1], shown in "Fig. 1.

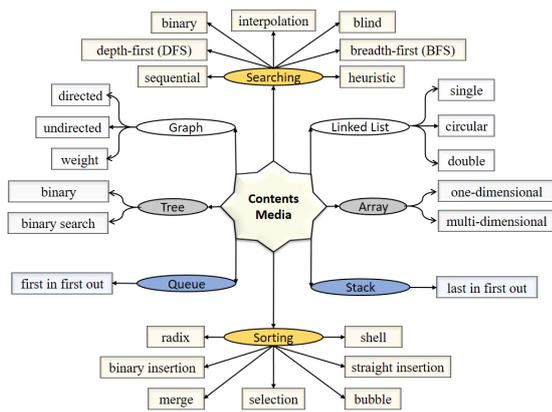


Fig. 1. Mind map diagram of contents media in data structure course app

The user interface of the Mobile Learning App can be seen in "Fig. 2".

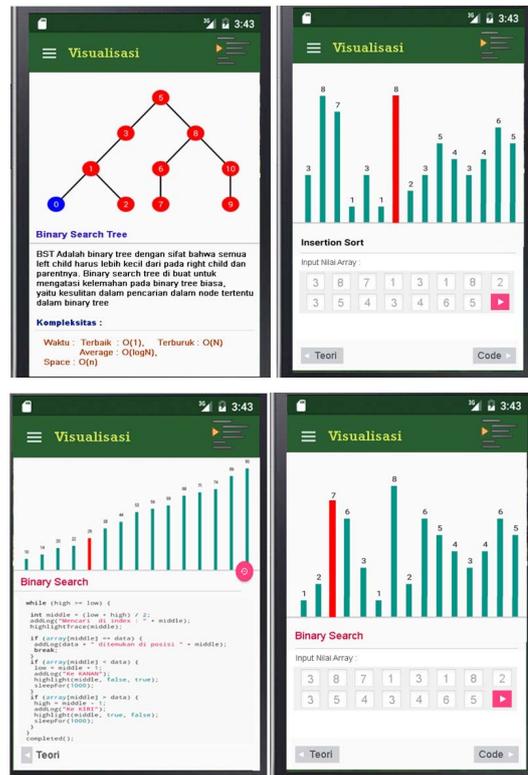


Fig. 2. user interface of the Mobile Learning App.

C. The Student Learning Outcomes

Reference [11] has perform a survey of some of the literature in the area of learning outcomes shows a number definitions, i.e.:

Learning outcomes are statements of what is expected that the student will be able to do as a result of a learning activity [12]. Learning outcomes are an explicit description of what a learner should know, understand and be able to do as a result of learning [13]. A learning outcome is a statement of what the learner is expected to know, understand and/or be able to do at the end of a period of learning [14].

The student learning outcomes on the object of research have decreased the value of learning, at the end of the lecture many students who have failed in the course learning process. a large number of students who fail to follow this course will affect the quality of learning.

The low student learning outcomes in each year in the informatics department are presented in TABLE I.

TABLE I. THE STUDENT LEARNING OUTCOMES FOR 2 ACADEMIC YEARS

Academic Year	Grade					Sum
	A	B	C	D	E	
2015/2016	11	32	87	79	18	227
2016/2017	22	20	45	81	9	177

^a. Source: Academic Information System

III. METHODOLOGY

A. Research Design

The design of this research using Quasi-Experimental Design [15]. The research design begins by determining the population and selecting samples from the existing population with Cluster Purposive Sampling. In the design, there are two groups that are each chosen randomly. The same material used for both groups is about Searching and Sorting, but in the experimental class used mobile learning media app, while in the control class applied conventional learning model.

TABLE II. RESEARCH DESIGN WITH CONTROL GROUP DESIGN

Group	treat	Post Test
Experiment	X ₁	Test
Control	X ₂	Test

B. Population and Sampling Techniques

The population in this study is all students who program the course Data Structure Academic Year 2017/2018. The population is Student Generation 2017, which consists of 4 classes i.e. class A, B, C and D. Samples taken in this research consist of 2 classes that class A as control class and class B as experiment class. The sampling technique used is a quasi-experimental design. Samples taken in this research using Cluster Purposive Sampling method.

C. Conceptual Definition

- Learning using media, Learning uses this media where Lecturers use the media with the tool of Mobile Learning App to explain teaching materials.
- Conventional Learning, Conventional Learning is a lesson that emphasizes the involvement of Students in Lecturer-centered activities. In conventional learning the teacher uses several methods, such as lecture method, practice method and assignment method.
- Learning outcomes, are the abilities that are owned by the Students after receiving their learning experience. Learning outcomes were obtained from the Student's effort after following the learning process by using the learning result test on the subject of Searching and Sorting.

D. The Operational Definition of a Aairiable

In order not to give rise to multiple interpretations and to avoid misinterpretation of the terms used in this study, the following operational definitions are given:

- (X) The independent variable is a learning model using mobile learning media and Conventional Learning.
- (Y) The dependent variable is the learning outcomes of the Students of the experimental class and control class groups in the Student.

E. Data Collection Technique

Methods of data collection conducted in this research are:

- Documentation, the preliminary data on the academic ability of the Student is obtained from the data of daily test results from the lecturers before the

treatment is done. Daily data on the material is the initial capability, and used for the formation of the group in the learning that will take place in the class.

- The test, this data was taken after each group received treatment, using mobile learning media in the experimental class and conventional learning in the control class. The final test result data will be processed and analyzed and then concluded whether there are differences in learning outcomes between the two treated groups.

Before the test is used as a research instrument, the test is first tested and then the item is analyzed. For the analysis of the degree of difficulty [16], [17], distinguishing, and reliability of multiple choice items [17].

F. Data Analysis Technique

- Descriptive statistics, used to describe data that is calculate the average value and standard deviation of a data. The data analyzed were preliminary test score data given in the study population, then selected two classes whose mean value of the initial test had significant differences.
- Inferential statistics, to perform hypothesis testing, first testing requirements analysis. before performing t test done first test of normality and homogeneity test two variance.
- Normality test, used to determine whether the data to be analyzed is normally distributed or not abnormally distributed, using the normality test [18]. The technique of calculating the normality test of this data using SPSS program.
- Homogeneity test, t test can be divided into two groups, t test with homogeneous variance and t test of heterogeneous variance. Homogeneous or heterogeneous variance is calculated using the F test [19].
- Hypothesis Testing, When the sample comes from population with homogeneous variance, then t test [20-25] is used.

Statistical Hypothesis in this study using SPSS computer program, then in draw the conclusion as follows:

- If $\text{sig} > \alpha$ then Ho rejected, means there are differences in student learning outcomes using mobile learning media applications with Conventional Learning.
- If $\text{sig} \leq \alpha$ then Ho accepted, means there are no differences in student learning outcomes using mobile learning media applications with Conventional Learning.

IV. RESULT AND ANALYSIS

A. Initial Value Data

Based on the results of the test obtained descriptive data shown in TABLE III and TABLE IV. TABLE III, it shows that the highest value of the control group is higher than the experiment group value, and the experiment group's lowest value is higher than the control group.

TABLE III. PRE-TEST SCORES

Group	Data Test Value			
	Average	Standard Deviation	Highest Value	Lowest Value
Experiment	53.77	9.62	75.00	34.00
Control	52.27	9.20	76.00	33.00

Based on the post-test results obtained descriptive statistics of experimental class and control group can be seen in Table IV.

TABLE IV. POST-TEST SCORES

Group	Data Test Value			
	Average	Standard Deviation	Highest Value	Lowest Value
Experiment	81.03	11.57	98.00	55.00
Control	75.50	11.84	95.00	50.00

TABLE IV, it shows that the highest value of the experiment is higher than the control group value, and the lowest control group value is lower than the value of the experimental group.

B. Inferential Analysis

- Preliminary Test Data Value Analysis

TABLE V. TESTS OF NORMALITY

Group	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Experiment after treat	.105	30	.200*	.950	30	.171
Control after treat	.155	30	.065	.939	30	.085

*. This is a lower bound of the true significance
a. Lilliefors Significance Correction

Test Data Normality in TABLE V, from the test results using SPSS 24 obtained value for the test results of the initial experimental group of 0.899 because the value of sig = 0.899 > 0.05 then Ho accepted. That is, the initial value data is normally distributed. While the results of the initial test of the control group obtained a significant value of 0.555 because the value of sig = 0.555 > 0.05 then Ho accepted. This means that the initial test data is also normally distributed.

Data Homogeneity Test, homogeneous or heterogeneous two variance were calculated using the F test. Based on the results of manual calculations obtained: F count = 1.119, F0.05 = 1.85. Since F count < Fa then H0 is accepted i.e. the two samples of the population with homogeneous variance.

The t test used is a free two-t test that aims to compare two mean values. Based on the results of manual calculations, to determine the differences in the use of conventional learning model and learning using the media of mobile learning app in the data structure course used two-averaged test with the criteria of hypothesis given that H0 accepted [20]. $T_{table} = \pm 1.699$, $T_{count} = 0.621$.

$$-1.699 \leq t_{count} \leq 1.699$$

Because the value of T count is less than T table then H0 is accepted, this means the average of group learning result using conventional learning model there is no difference with mean of learning result using media of mobile learning app.

- Post Test Data Value Analysis

Test Data Normality in TABLE V, from the test results using SPSS 24 obtained value for the test results of the initial experimental group of 0.171 because the value of sig = 0.171 > 0.05 then Ho accepted. That is, the initial value data is normally distributed. While the results of the initial test of the control group obtained a significant value of 0.085 because the value of sig = 0.085 > 0.05 then Ho accepted. This means that the initial test data is also normally distributed.

Data Homogeneity Test, homogeneous or heterogeneous two variance were calculated using the F test. Based on the results of manual calculations obtained: F count = 0.955, F0.05 = 1.85. Since F count < Fa then H0 is accepted i.e. the two samples of the population with homogeneous variance.

- T test to Determine the Difference between the Experiments group and the Control group

Based on the results of manual calculations, to determine the differences in the use of mobile learning models and conventional learning on the material Searching and Sorting, used two average difference test obtained:

$$T_{count} = 1.830$$

$$T_{table} = 1.699$$

Since the value of t count is more than T table then H0 is not accepted, this means the average of learning result by using mobile learning media is different with the average of learning result of conventional learning, or there is a real difference between mean of learning result by using mobile learning media with conventional learning. This difference shows that learning outcomes using mobile learning media are better than conventional learning outcomes, this is supported by the average learning outcomes of each group, for the experimental group and the control group.

The low learning outcomes of students from year to year in the field of informatics at the university where the author teaches, various approaches and learning models have been applied, but changes in student learning outcomes are not significant, one of the factors caused by the difficulties of Student learning in the Data Structure Course.

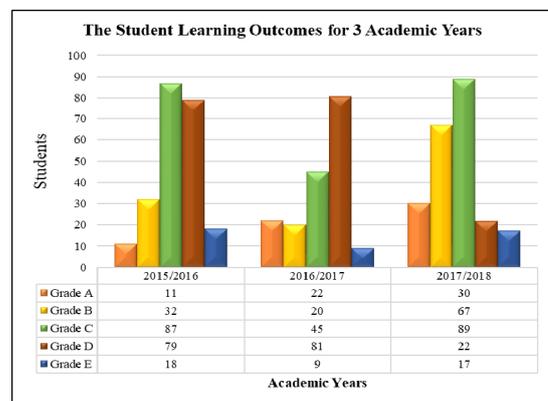


Fig. 3. Comparison of student learning outcomes for 3 academic years

Utilization Mobile-based learning technology to be one solution in helping teachers become teaching tools that can be packaged into a media of learning whenever and wherever students can use, it should be the teachers apply the mobile learning technology.

Since this year (academic year 2017/2018), we have taken advantage of mobile learning media applications that we have developed. And media influence can significantly increase student learning outcomes, particularly in the Data Structure course. Improvements in student learning outcomes are presented in "Fig. 3".

V. DISCUSSION AND CONCLUSION

This study discusses differences in learning outcomes in the data structure between students taught using mobile learning media and conventional learning on the subject matter of Searching and Sorting Academic Year 2017/2018.

This study required 2 samples of the group, one group as the experimental class and one other class as the control group. In the Informatics department for the class of 2017 consists of 4 classes. Because it takes only 2 classes, then from 4 classes taken 2 classes by looking at the difference in the average value of the exam to be made in the experimental class and control class. From the test results in the previous material, it was found that the results showed that the experimental group and the control group came from the same initial condition, after the normality test and homogeneity test showed that both samples were normal distribution and there was no difference of variance. Then in the experimental group conducted treatment with the given mobile learning media while the control class is given the conventional learning treatment.

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The learning process in the experimental group is given treatment with mobile learning media, where the students are required to take an active role in teaching and learning process. While the learning process in the control group with conventional learning, Lecturers explain about the material and Students listen to the explanation and asked if there is material that has not or less understood.

After both classes have been treated in the teaching and learning process, both groups are given a test for the evaluation of learning outcomes or final tests in the material. The average final test result obtained for the experimental group was 81.03 and for the 75.50 control group. This means the average experiment group is higher than the control group average. It is also clarified by t-test results where t-

count value is 1.830 with t table 1699, because the value of t-count $1.830 > t\text{-table } 1.699$, means H_0 rejected and H_1 accepted means there are differences in student learning outcomes between conventional learning by using mobile learning media.

Based on the normality test and homogeneity test, it was found that the evaluation data of the results of the two groups, namely the experimental group and the control group are normally distributed and the variance of the two homogeneous groups. The results of the analysis show that for the experimental group obtained the probability value 0.171 with a significant level of 0.05. This means the experimental group is normally distributed. For the control class obtained probability value of 0.085 with a significant level of 0.05. This means the control group is normally distributed. For homogeneity test, based on the calculation results obtained values $F\text{ count} = 0.955$ and $F\text{ table} = 1.85$ with $\alpha = 0.05$. Because $F\text{ count} < F\text{ table}$ it can be concluded that both groups are homogeneous.

This shows that in teaching and learning process, teachers who teach using instructional media more support in improving student learning outcomes, compared with teachers who use conventional learning model. Based on the results of the above discussion it can be concluded that there are differences in learning outcomes between students who were taught using mobile learning media with students taught with conventional learning. Where learning using media is better than conventional learning.

ACKNOWLEDGMENT

This research is funded by Non-Tax State Revenues (PNBP) Department of Information and Communication Technology (ICT) Year 2018. Thanks to the Dean of the Faculty of Computer Science and Information Technology.

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