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Development of Mobile Learning Applications as Learning Media Using Android Studio

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ABSTRACT

The rapid development of Science and Technology has resulted in a change in the learning paradigm characterized by changes in curriculum, media and technology. Technological innovations and information systems in the world of education, especially in higher education, have their own appeal for students, because conventional learning sometimes makes students less creative in the learning process. In today's technological advances, Android phones have now become a necessity for the community, especially among students and students. Smartphone media is very influential in the teaching and learning process between lecturers and students in the 21st century era and is one of the distance learning media solutions. The purpose of this research is to develop a mobile learning application as a distance learning media using Android Studio to facilitate and improve the efficiency of the learning process in higher education. The method used in developing this system is the waterfall method with stages with the Unified Modeling Language system design tool. The population in this study were students in the Database course in semester 2 as many as 55 students. The result of this research is a mobile learning application using Android Studio that is effectively used as a medium for distance learning in higher education. With this mobile learning application, Android-based learning has created interesting and dynamic learning for lecturers and students, so this creates many benefits and can minimize the obstacles that have occurred in the learning process and help students like learning more.

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1. INTRODUCTION

In the current era, the implementation of education cannot be separated from the development of Science and Technology (IPTEK) [1]. In today's technological advances, android mobile phones are now a necessity for the community, especially among students and students, but there are still many young people who use them in directions that do not support learning and education. One of the factors that cause the low quality of learning is that various learning resources have not been utilised to the fullest, both by lecturers and students [2]. The use of increasingly varied media is a challenge for lecturers in carrying out their duties as teachers in order to achieve learning objectives. The use of learning media is an inseparable part and is already an integration of the learning methods used. The use of increasingly varied media based on android applications is a challenge for lecturers in carrying out their duties as teachers in order to achieve learning objectives [3]. The use of smartphones that are fairly easy to carry, easily accessible and affordable as media in learning will greatly impact students.

The rapid development of Science and Technology has resulted in a change in the learning paradigm which is characteristics by changes in curriculum, media, and technology. Good learning media interprets abstract concepts to be easily understood [4]. At this time learning in Higher Education is still conventional, where the learning model is still one-way, namely the source of knowledge only comes from lecturers [5].

Smartphone media is very influential in the teaching and learning process between lecturers and students in this 21st century era and is one of the distance learning media solutions [5]. Smartphone media, namely as a teaching and learning media for lecturers and students, as a means of communicating, as a tool for finding information and adding insight, will certainly make it easier for students in the learning process from home in the 21st century era. With Android-based learning creating interesting and dynamic learning, this has many advantages that help students prefer learning.

Many new types of learning mostly claim to consider a deeper understanding of the discipline combined with the essence of humanity, emotional intelligence, critical thinking, and creativity. This kind of learning is called deep and meaningful learning [7]. This research aims to develop a mobile learning application that is applied in higher education using android studio, so that students and lecturers can do online learning anywhere and anytime. With the mobile learning application, it can increase the enthusiasm of students in the learning process.

According to previous research [8], mobile learning (m-learning) is a combination of mobile computing and electronic learning (e-learning) that can be accessed wherever you are with strong search capabilities, abundant interaction and effective performance-based learning and assessment support. The concept of m-learning brings the benefits of the availability of teaching materials that can be accessed at any time and the visualisation of interesting materials. The term m-learning refers to the use of handheld devices such as PDAs, mobile phones, laptops and information technology devices that will be widely used in teaching and learning, in this case we focus on mobile phone devices.

The purpose of developing m-learning applications is to make the learning process more efficient so that students can be more active in the learning process. The more important role of m-learning as one of the information technology-based learning that can be one of the alternative solutions suggested by learning experts in reducing student anxiety. M-learning can be used to encourage independent and collaborative (group) learning experiences. M-learning helps learners to identify learning problems where they need help and support. M-learning helps to reduce resistance to the use of computer information technology and can help bridge the gap between mobile phone and computer technology comprehension skills. Mobile learning helps to remove learners' aversion to formal learning experiences. M-learning helps learners to focus on learning for longer periods of time. M-learning helps to increase confidence in self-learning.

Along with the rapid release of Android version updates, there are now many alternative programming languages that make it easier for developers to write Android applications [9]. Android is an operating system that has become one of the basic needs. Almost everyone needs this one tool to communicate, search for information and peruse the internet [10].

Android Studio is an Integrated Development Enviroment (IDE) for the Android operating system, built on JetBrains IntelliJ IDEA software and designed specifically for Android development. This IDE is a replacement for Eclipse Android Development Tools (ADT) which was previously the main IDE for Android application development. Android studio itself was first announced at the Google I/O conference on May 16, 2013. This was the preview stage of the version in May 2013, and entered the beta stage since version 0.8 and began to be released in June 2014. The first stable release version was released in December 2014, starting from version 1.0. While the current stable version is version 4.0 which was released in May 2020 .

2. RESEARCH METHOD

Research methods are steps taken by researchers to collect data or information to be processed and analysed scientifically [11]. The method used in this research is quantitative descriptive method. Quantitative research method is a research method based on the philosophy of positivism, used to research certain populations or samples [12]. The

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sampling technique is random, data collection uses research instruments, data analysis is quantitative / statistical with the aim of testing predetermined hypotheses. The population in this study were students in the Database course in semester 2 as many as 55 students. The form of sampling in this study is proportional sampling. Data were obtained through observations, interviews, and questionnaires.

Data analysis technique is a process of processing data into new information which aims to make the characteristics of the data easier to understand and useful as a solution to a problem, especially those related to research. Data analysis is grouping data by studying the data then sorting the data that has been collected to find important data which must be studied. The next step, the literature and field data are collected. Then the researcher compiles the data, describes the data, and system atises the data that has been collected to be studied with a qualitative descriptive method, namely an analysis that describes the state or status of the phenomenon in words or sentences, then separated by category to obtain conclusions.

The system development method is a formal and precise system development process that defines a series of activities, methods, best practices and automated tools for developers and project managers in order to develop and maintain as a whole information system or software. The software development method used to develop the system is the Waterfall model and tools to design the system using the Unified Modeling Language (UML). In previous research [13] said that, the Waterfall model is a sequential or sequential software life flow approach starting from analysis, design, coding, testing and supporting stages. the waterfall model can be described as in Figure 1 below:

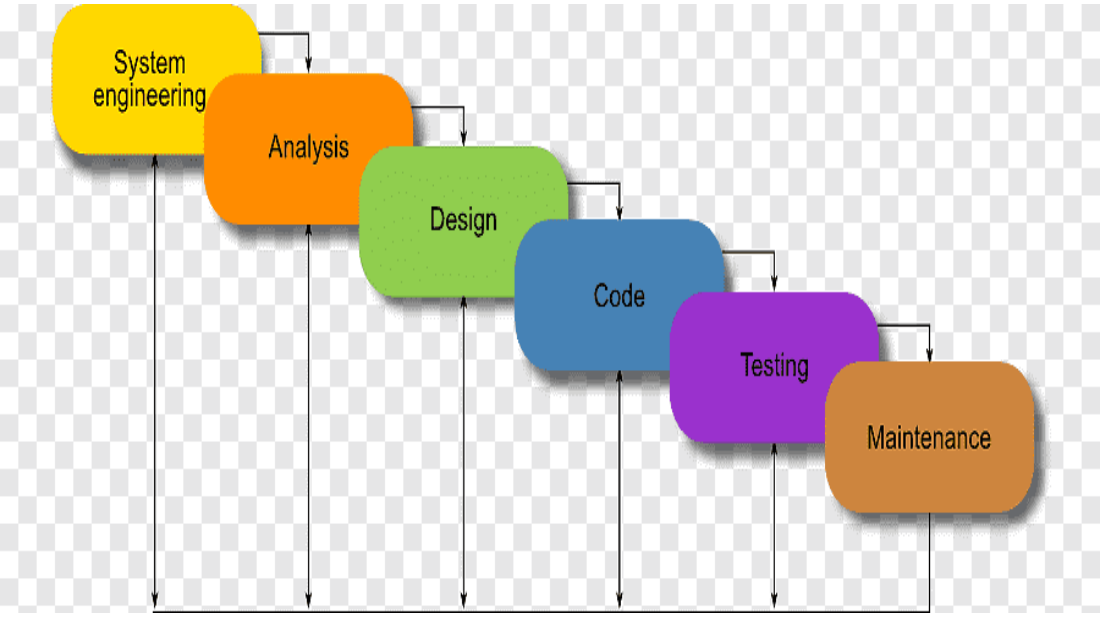

Figure 1. Waterfall Model

The steps in the Waterfall model for learning media are as follows:

2.1. System Engineering

System engineering is a powerful approach to the design, manufacture, and operation of systems. In simple terms, this approach consists of identification and quantification of system objectives, creation of alternative system design concepts, design trade performance, system selection and implementation.

2.2. Learning Device Needs Analysis

The process of using learning devices is carried out intensively to specify the needs of learning devices so that it can be understood what kind of learning devices are currently used and the learning devices needed by students. The specification of learning device needs at that stage needs to be documented. At this stage, analysing what data can be used as information as a reference in making or designing Android-based learning applications.

2.3. Design

Software design is a process that focuses on the design of creating software programs including data structures, software architecture, displays and coding procedures. Designing a new system that can solve the problems in making this final project guidance application is an effort to build a waterfall application on Android-based learning in higher education, so that it can be accessed using the Smartphone of every lecturer and student. The features of the application are the Login feature for admin, students and lecturers, attendance data input, admin data input, group member data input, lecturer data input, class info data input, group info data input, absence content data input, class data input, student data input, material data input, group name data input, task data input, task upload data input.

2.4. Programming Code

The design is translated into the form of a software programme. The result of this stage is the development of applications in the form of computer programs in accordance with the design made at the design stage. The programming language used in making this application uses the Android Studio programming language.

2.5. Testing

Testing focuses on the software and ensures that all parts have been tested. This is done to minimise errors and ensure the results are as expected. At this stage, testing the Android-based learning application development programme in higher education.

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2.6. Maintenance

Maintenance on the software is needed after the testing stage. In this Android-based learning application development program, it is very necessary to do maintenance regularly, so that the system can run smoothly.

3. RESULTS AND DISCUSSION

Global design is a general description of the system to be created, and the things that support the realisation of the new system [14]. This design is a preparation of a detailed design that identifies the components of Android-based learning media that will be designed in detail. Global design can also provide convenience for users in learning and using applications produced by the system. Based on the analysis conducted previously, the modelling used is Unified Modelling Language (UML) which includes Use Case Diagram, Activity Diagram, Sequence Diagram, and Class Diagram. UML is a language based on graphics or images to visualise, specify, build and document an object-based software development system [15].

3.1 System Design with UML

Use Case Diagram is a description that will be done by an actor in the form of a diagram [16];. According to [17], Use Case Diagram is modelling for the behaviour of the information system to be created. Use Case Diagram describes an interaction between one or more actors with the information system to be created [18]. Use cases are used to find out what functions are in an information system and who has the right to use those functions [19]; [20]. Based on the above definition, it can be concluded that a Use Case Diagram is a description of what an actor will do in the form of a diagram. There are 3 actors in this system, namely Admin, Lecturer, Student. Use Case Diagram of Android-based mobile learning media in Higher Education can be seen in Figure 2.

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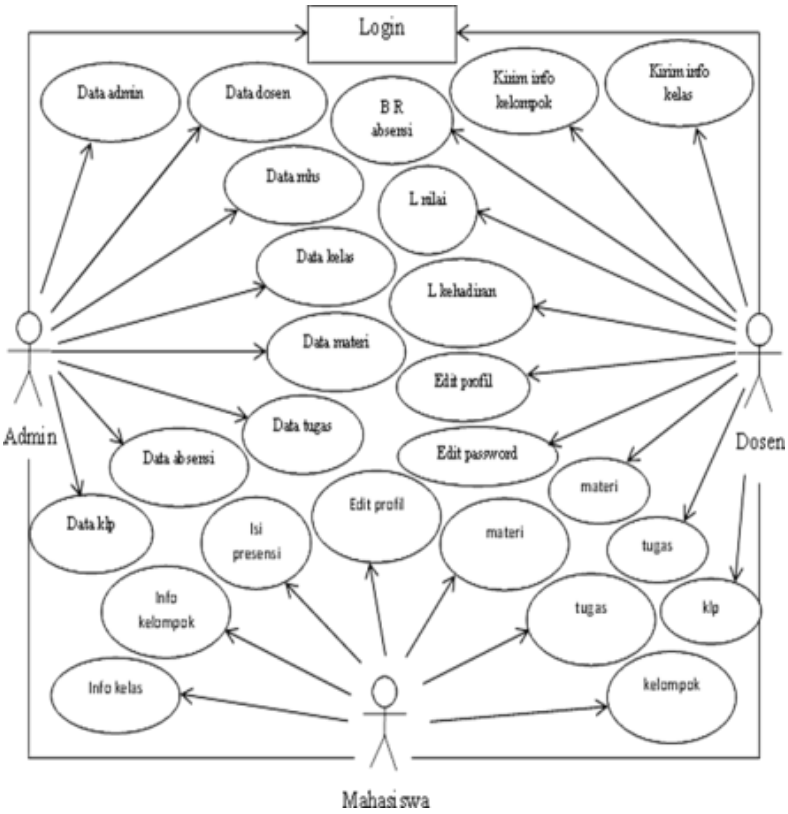

Figure 2. Use Case Diagram of Mobile Learning Application

In Figure 2 is a form of Use Case Diagram of Android-based learning media in Higher Education. On this page there are 10 menus, namely the attendance menu, group members, class info, group info, contents of absences, classes, materials, group names, assignments, upload assignments. Admins, lecturers, and students can manage all menus in the system.

Sequence Diagram describes the interaction between objects in and around the system in the form of messages (Message) arranged in a time sequence, namely the sequence of events performed by an Actor in running the system. This diagram is specifically associated with the Use Case. This diagram shows how detailed operations are performed, what messages are sent and when they occur. Sequence Diagram consists of vertical dimension which is time and horizontal dimension which describes related objects. Sequence Diagram Lecturer using Android-based learning applications. This diagram explains the sequence of steps taken by a lecturer to use the application, with the form of design as shown in Figure 3.

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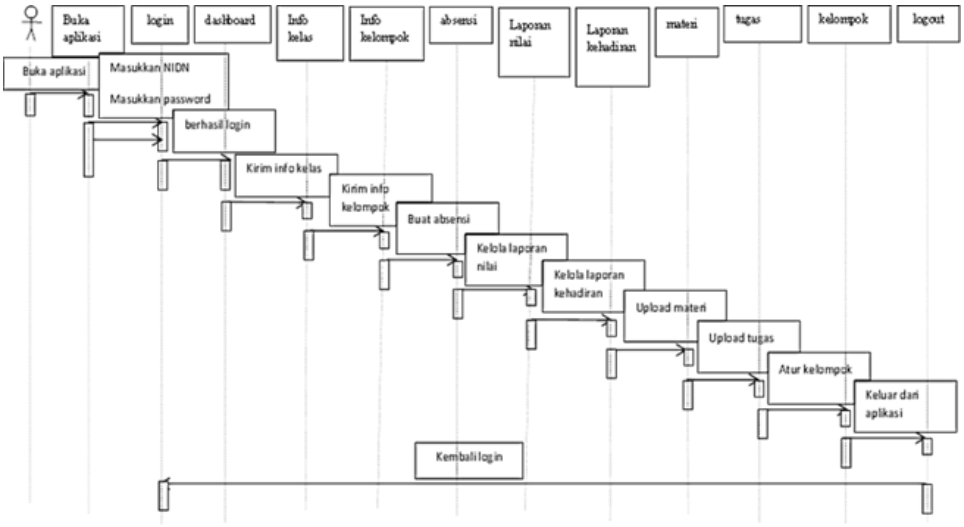

Figure 3. Lecturer Sequence Diagram

Class Diagram defines what information an object has and defines the behaviour it has. Class Diagram abstracts the elements of the system being built and designed. The following is a Class Diagram design of Android studio-based mobile learning media that can be seen in Figure 4.

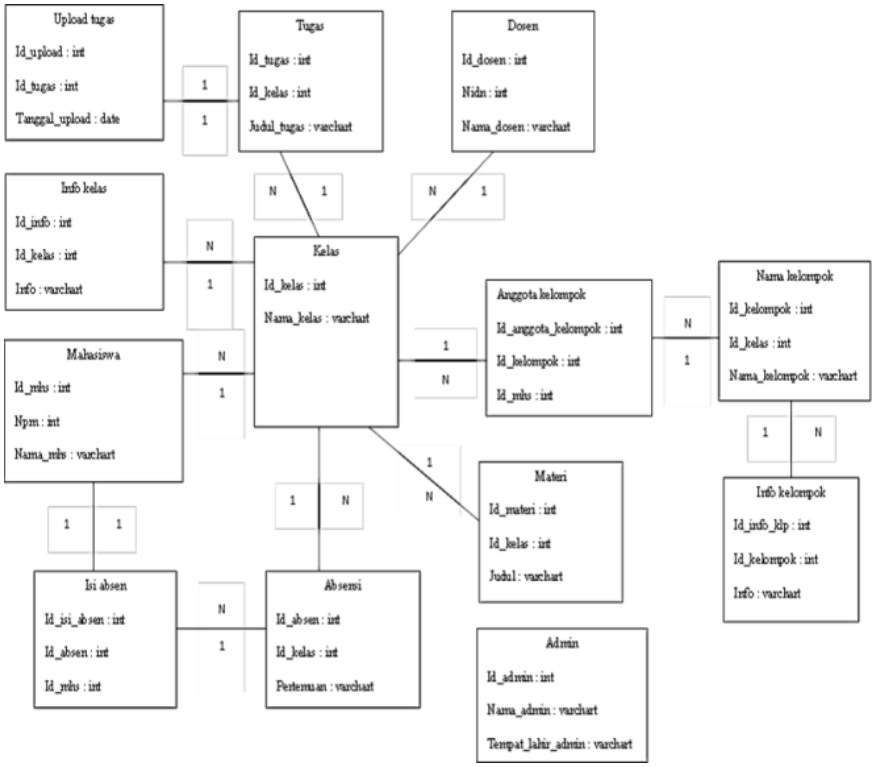

Figure 4. Class Diagram of Mobile Learning Application

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3.2 Implementation Stage

The system implementation stage is a procedure carried out to complete the system design in the approved system design document and test, install and start using the new system. The purpose of the implementation stage is to complete the approved system design, test and document the necessary system programmer and procedures, ensure that the users involved can operate the new system and ensure the conversion of the old system to the new system, and correctly. The following is the implementation of the mobile learning application interface as an Android-based learning media.

The purpose of the implementation stage is to complete the approved system design, test and document the necessary system programmer and procedures, ensure that the users involved can operate the new system and ensure the conversion of the old system to the new system, and correctly. The following is the implementation of the mobile learning application interface as an Android-based learning media in Higher Education:

3.2.1. Login Page

The initial display or login page of the mobile learning application as an Android-based learning media can be shown in Figure 5 as follows:

Figure 5. Login Page

This login page functions as a form that will be used by admins, lecturers, and students to be able to enter the Android studio-based mobile learning application in Higher Education.

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3.2.2. Lecturer Main Page

The main page when the lecturer successfully logs in to the mobile learning application as an Android-based learning media, there are material menus, assignments, groups, send class info, send group info, create attendance plans, grade reports, attendance reports, and accounts. For more details can be seen in Figure 6.

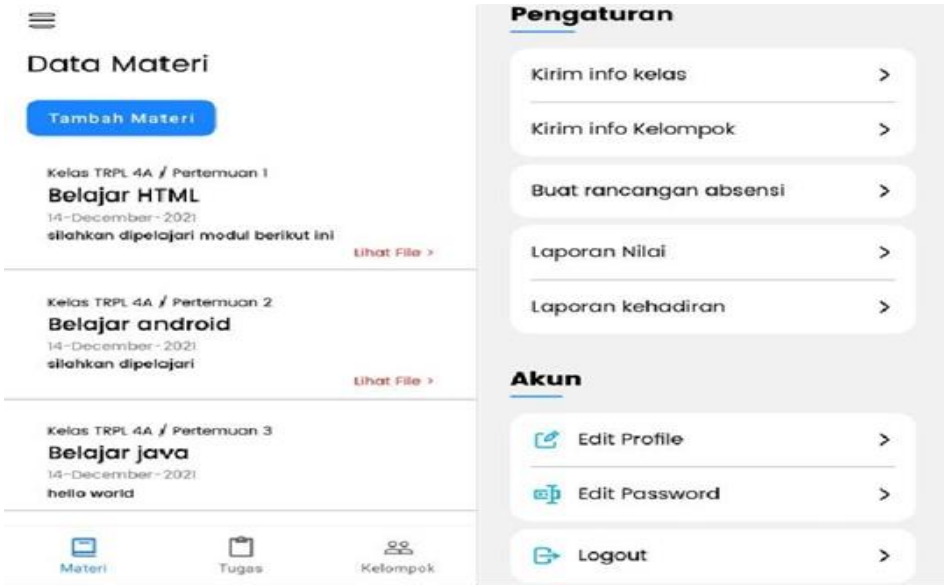

Figure 6. Lecturer Main Page

In Figure 6 there is a lecturer dashboard display which consists of a menu to send class info, send group info, create attendance plans, grade reports, attendance reports, edit profiles, edit passwords, materials, assignments, and groups.

3.2.3. Student Data Input

The student data input form has a save button which is useful for saving student data that has been inputted by the admin into the database, which has attributes such as student name, NPM, place of birth, date of birth, gender, address, nohp, class, email, password, and photo. For more details can be seen in Figure 7.

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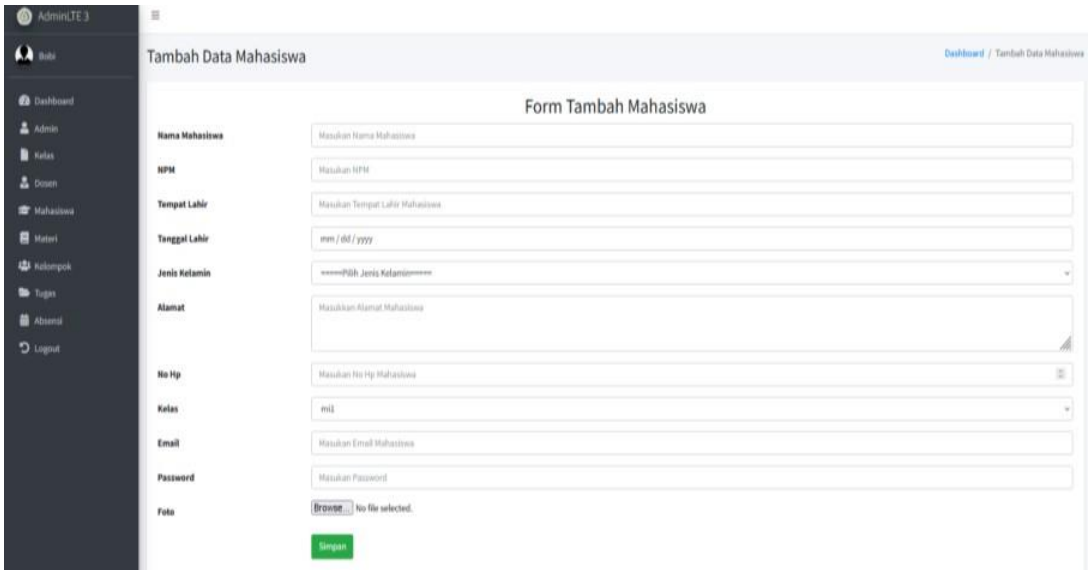

Figure 7. Student Data Input

In Figure 7 there is a student data input display which consists of the attributes of student name, NIM, place of birth, date of birth, gender, address, contact number, class, email, password, and photo.

3.3 Evaluation of Application Use

The evaluation and monitoring process is carried out after the application is used by students and has been implemented in the learning process. The author uses Google Form to review the effectiveness of the application provided. In addition, the purpose of this evaluation is to see the shortcomings of the application that has been developed to be further refined. Through Google Form, data was collected from 55 students who were given more specific questions about the mobile learning application that had been used. Students were given a list of questions to evaluate the mobile learning application, as listed in Table 1 below:

Table 1. List of Questions for Evaluation of Application Use

Question	Student Assessment			
USABILITY	Strongly disagree	Disagree	Agree	Strongly agree
1. Easy operation of mobile learning application				
2. The mobile learning application is able to encourage students' enthusiasm for learning	Strongly disagree	Disagree	Agree	Strongly agree

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3. The mobile learning application has an attractive appearance and is easy to learn	Strongly disagree	Disagree	Agree	Strongly agree
4. The mobile learning application page has a clear appearance and is easy to understand.	Strongly disagree	Disagree	Agree	Strongly agree
5. Mobile learning application is easy to access for beginner users	Strongly disagree	Disagree	Agree	Strongly agree
6. Mobile learning applications are effective as online learning media	Strongly disagree	Disagree	Agree	Strongly agree
INFORMATION QUALITY	Strongly disagree	Disagree	Agree	Strongly agree
7. The mobile learning application provides accurate reports				
8. The mobile learning application makes it easy for students to communicate with lecturers	Strongly disagree	Disagree	Agree	Strongly agree
INTERACTION QUALITY	Strongly disagree	Disagree	Agree	Strongly agree
9. Mobile learning application provides security for student user information				
10. The mobile learning application is in accordance with the expected usability	Strongly disagree	Disagree	Agree	Strongly agree

Based on the questionnaire results from the questions in Table 1, there are 3 question criteria including usability quality, information quality and interaction quality services. The results of student responses through the questionnaire can be shown in Table 2 below.

Table 2. Student Assessment Results

Criteria	Student Assessment	
	Agree	Disagree
Usability	86%	14%
Information Qualitiy	71%	29%
Interaction Quality	78%	22%
Average	78,3%	21,7%

From the results of student research, it can be described in the form of a graph. For more details can be seen in Figure 8 graph below:

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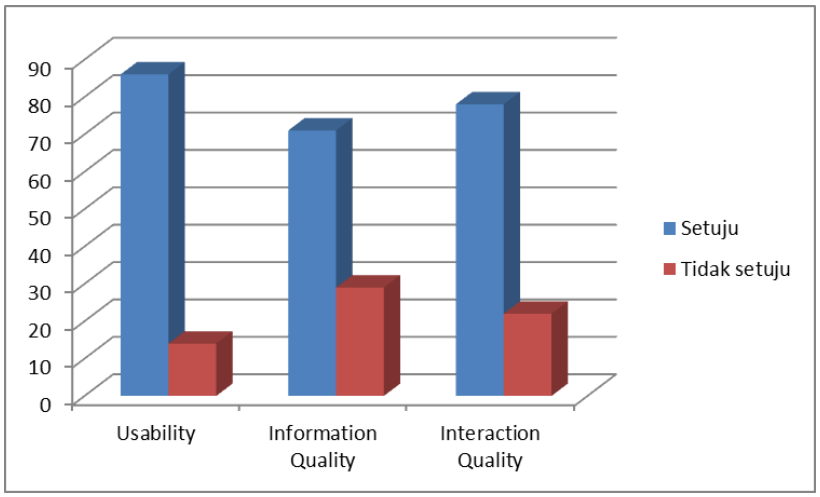

Figure 8. Evaluation Results of the Use of Mobile Learning Applications

From the Figure 8 graph above, the overall average is 78.3% of students from 3 categories of questions agreeing that mobile learning applications are easy and effective to use by students in higher education. This result shows that the quality of mobile learning applications is declared effective for student use in online learning.

4. CONCLUSION

After conducting various analyses and application development and data processing as well as testing the application of the developed system, several conclusions can be given in the form of views while conducting research, namely the existence of mobile learning applications as android-based learning media in universities, can help students solve problems related to courses. In addition, by using mobile learning applications as android-based learning media, students can learn online through mobile learning applications In addition, by using mobile learning applications as android-based learning media, students can learn online through mobile learning applications.

The results of student responses through questionnaires show student assessments which include, among others: (1) Usability obtained 86% with agree category, and 14% with disagree category (2) Information Quality obtained 71% with agree category, and 29% with disagree category (3) Interaction Quality obtained 78% with agree category, and 22% with disagree category. The overall average of student assessments is 78.3% of students from 3 categories of questions agree, and 21.7% disagree. This shows that mobile learning applications are easy and effective to use by students in higher education. It can be said that the existence of this mobile learning application can provide opportunities for students to be able to access attendance, materials, assignments and other features online, so as to improve students' ability to learn independently through android-based learning media

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made and can facilitate lecturers in providing assignments and collecting assignments by students. This android-based learning media can be used in the process of collecting assignments by students and can be done online so that it is more practical and easier.

In addition, with the mobile learning application as an android-based learning media studio in the online task collection process can reduce the loss of scattered student task data so that student task data is stored more safely. The existence of Android-based learning media in Higher Education is very helpful for lecturers if the lecturer is absent, learning can be done online through Android-based learning media, so that the learning process can take place efficiently and effectively.

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