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The Innovation Breakthrough in Digital and Disruptive Era

An Activity-Oriented Conceptual Framework for Mobile Learning Database Educational Classroom

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Abstract. Mobile learning is very helpful in replacing the implementation of online teaching and learning activities during the COVID-19 pandemic. The use of mobile learning will be very helpful in the implementation of teaching and learning activities, especially when using it as a learning medium. This needs to be regulated in a learning framework. We made modifications to the design framework of the m-Learning activity, to describe the Requirements & Constraint Analysis cycle, m-Learning scenario design, technology environment design, learner support services design. We found that the framework still needed additional Learning Outcomes at the beginning of the cycle. This learning achievement is important so that the learning carried out can be measured and evaluated as material in the future. The results of the development of this framework have been successfully implemented in database learning in vocational high schools. We conclude that this framework is very important to be applied to activity-oriented learning using mobile learning so that it can produce optimal learning outcomes.

1. Introduction

Mobile learning is an option that is widely used in developing countries. Learning that is carried out through mobile devices is an attractive option at this time. Statistically, the devices used in accessing online learning mostly use mobile devices. Mobile users according to the world bank in 2019 per 100 people reached 109,397 registered mobile cellular subscriptions[1][2]. In 2020, when the covid-19 pandemic occurred, the world of education moved physical classes into virtual classes. there is no other choice that can be done other than online learning. This makes mobile learning penetration very high in many countries in the world. Now, after the pandemic COVID-19 has begun to be controlled in several countries, and limited face-to-face learning has begun to be implemented. Some difficulties occur because of some limitations such as the teacher having to spend more time for one person in teaching one material because the class is divided into two parts and students take turns in groups providing study time with the same teacher. Teachers find it quite difficult to allocate time because the number of classes has doubled than usual. Indeed, online learning is not an easy choice during the CIVID-19 pandemic [3]. But that choice must still be used in many technological infrastructure limitations, difficulties in building digital learning content, and low readiness for online learning users in developing countries.

Face-to-face learning in the classroom during the COVID-19 pandemic is still very risky for both teachers, students, and all learning supporters, both laboratory assistants, and administrative service employees. Therefore, it is very necessary rules for the implementation of limited face-to-face. These rules must be carried out with discipline so that all parties involved can be protected. Learning in the classroom can be meaningful if it is implemented by having a clear output measure from the start. This measure is needed to be able to provide an evaluation and assessment of a learning activity. Thus, this meaningful learning can be sustainable, because it continues to be evaluated and increasingly developed according to the needs of the times. To achieve the learning objectives, it needs support from various parties. One component that needs to be considered is learning through mobile devices in the form of mobile learning. Learning through mobile learning must meet various requirements so as not to cause resistance by users [4]. It is also necessary to consider the various advantages of using mobile learning for learning activities [5]. The advantage that needs to be considered in the use of mobile learning is the application of meaningful learning is applied to the use of mobile learning media,

which is caused by many mobile users in developing countries. Learning media that are technologically applied and have a fairly high user level are mobile devices, either IOS or Android. Mobile devices make learning more personal because they are used individually, but still have classroom-like interactions because there are materials and instructions to follow. The use of mobile learning is expected to increase students' motivation [6].

The main problem in developing mobile learning media is the difficulty of determining the context in learning according to the learner's activities. This is due to differences in culture, facilities, and infrastructure to support learning and access to learning resources. In developing countries, learning contexts are very diverse and difficult to integrate. This of course will make learning materials must be reformulated according to the learning context so that they can produce meaningful learning [7]. The solution to overcome this is to try a cloud technology model to perform big data analysis in formulating learning activities [8]. This solution is very good because each learner will be analyzed so as to find the right learning context according to the context of each student. But in developing countries that still have limited infrastructure, this solution is still difficult to implement. A formula is needed to make learning activities can be formulated so that they can be built on mobile learning content. A formative assessment is needed to be adapted to see the overall learning context [9][10]. A professional community is needed in formulating a learning context properly and in accordance with the It is very important to formulate a learning activity in the use of mobile learning. This is very important in order to provide a mobile learning-based learning model that is easy to adopt. Several activities-based mobile learning framework designs have been built and implemented [12], some have also built a lifelong learning mobile learning model [13]. However, the framework does not address the learning outcomes to be achieved, so that when mobile learning is implemented, it is still difficult to provide learning according to the learning context. This paper tries to formulate a framework that is easy to implement by paying attention to aspects of learning outcomes according to the context of student learning. This learning outcome is very important to provide learning direction so that learning through mobile learning can be implemented properly and it is easy to evaluate the learning. This is important because, in developing countries, learning outcomes are used to manage the learning atmosphere in the classroom, including the use of mobile learning between teachers and students [10][14]. Therefore, we need an activity-oriented framework in the classroom in building mobile learning. This requires treatment with a different approach because even though the class has been carried out physically, it still has to pay attention to the handling of Health procedures that are strictly applied.

This study aims to produce a concept of a mobile learning framework in learning using mobile learning and try to implement it to see the advantages of the framework that was built. This framework concept is achieved by finalizing the mobile learning activity framework by adding an outcome learning component as an important part of building mobile learning that is easy to implement. It is hoped that this improved framework can be implemented easily so that it can improve the existing framework.

2. Design Framework mLearning

Mobile learning development should be activity-based so that it is easy to implement mobile learning. An activity that is intended to improve the user experience. A good user experience will drive high adoption rates of mobile learning. In developing an activity-oriented framework, an activity framework has been developed to build mobile learning [15]. The framework was developed with five components to design mobile learning [12]. See figure 1. The five frameworks are m-learning activity design which is the main component that is the focus of activity-oriented. The second component begins by analyzing requirements and constraints which are the basis for developing mobile learning applications. The third component is Scenario Design which contains various scenarios of activities that will be run in the mobile learning application. Generally, scenarios are designed to follow the learning flow, such as introduction, student materials, assignments, and evaluations. The fourth component is the technology environment component which contains the technical requirements in developing mobile learning applications such as the platform to be used, the technological infrastructure that must be provided, and various software for development as well as other technical specifications. The fifth component is

learner Support service design which contains technical support in usages such as how to install mobile learning applications on mobile phone devices, user guides, and troubleshooting.

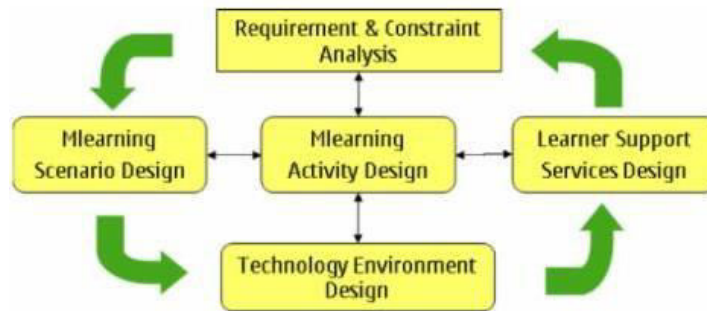


Figure 1. Conceptual Framework for Personalization

A general framework for Mlearning Experience Design consists of Requirement & Constraint Analysis, Mlearning Scenario Design, Technology Environment Design, and Learner Support Services Design. The first one, Requirement & Constraint Analysis. In requirement, there is two-level, general, and concrete level. Meanwhile, for constraint analysis, there are two-part, usability constraint and cost-effectiveness. The second one, Mlearning scenario design is a scenario that will describe how learners with certain characteristics in certain settings carry out various activities to achieve their learning goals. The third, the mLearning technology environment is the conditions such as content databases, learning tools, platforms, networks, etc. that support and sustain the mLearning activities. The fourth one is a support service for the learner using the app with ease of mind.

In its development, the mobile learning framework needs to pay attention to various software development artifacts that will later be used in the development, testing, and quality assurance of the resulting mobile learning products [16]. In the process of developing, implementing, and testing it, we used examples from database learning in vocational high schools as examples in the implementation of the developed framework [17]. The learning context follows the learning context in developing countries and we chose Indonesia as the place to develop and implement the framework.

3. Result and Discussion

The application of an activity-oriented framework still needs to be added to the learning outcome component. This is important to answer the learning context [18][19]. Learning Outcome Design was added at the start of the mobile Learning activity framework. This Learning Outcome facilitates teachers to make a design for using mobile learning activities in the classroom so that they can interact in class more meaningfully [20]. In contrast to the use of conventional learning media, mobile learning, especially in the classroom, needs to be regulated, because of its personal nature, mobile devices can be used incorrectly, in fact, it only becomes a boomerang when students only use it not as a learning medium. The result of the development of a new framework that we call the m-Learning activity framework for Mobile Learning. See figure 2.

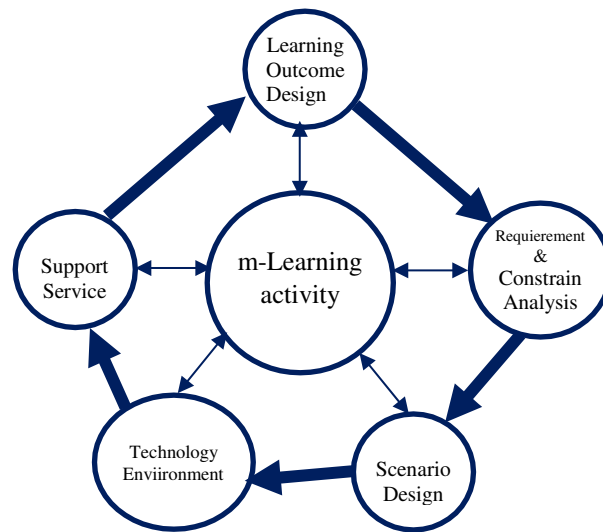


Figure 2. m-Learning activity framework for Mobile Learning

The components that we produce from the m-Learning activity framework for Mobile Learning are as follows.

Learning Outcome Design

The expected output of this database learning activity is student mastery of learning in class. It is hoped that after learning using mobile learning students can explain how a learning outcome has a good impact and after that can make a simple outcome [21]. This learning outcome also regulates the procedures for taking grades, from activities carried out in class, such as practice, exams, quizzes, use of tools in learning, direct assessment with students, and exams conducted in the learning process in the classroom.

Requirement & Constrain Analysis

What is needed for mobile learning is in the form of requirements, at the general level features that usually exist are in the form of videos, texts, and learning evaluations. It is hoped that mobile learning can be a learning medium that can encourage students to learn about databases in the classroom. While in the concrete requirements analysis, according to existing conditions, restrictions are applied to the implementation of the Health protocol. It is very helpful for the teacher, because the teacher easily only gives instructions in front of the class, and students can directly access the material contained in mobile learning. The teacher just controls whether the student is accessing the existing learning application or not. Teachers can also emphasize existing instructions for students who do not clearly understand the material, videos, texts, or evaluations of existing learning. So this is in accordance with the existing conditions that are ongoing, classroom learning is carried out without having to interact a lot with students, also by maintaining a distance according to the established Health protocol. In the constraint analysis, usability and cost-effectiveness. Applications developed are made according to the needs of existing users and with cost-effective use

Scenario Design

The scenario design developed in the use of mobile learning is in the form of using it as a learning medium in the classroom, but it can also be studied again by students when they are outside the classroom. In the classroom, the scenario is arranged so that students stay focused on the learning application that is being discussed and is tightly controlled by the teacher. The application takes into account the user side to stay motivated and its use is in accordance with the available technology side [22].

Technology Environment Design

In terms of the technology used, this learning can run multi-platform on IOS and Android. There is no need to use internet bandwidth, because this application can run offline, taking into account the need for internet access and quotas that students often don't have or network constraints that can sometimes drop internet access. The content of this application itself is in the form of text, video, and animation [23]. Keeping the content light and small in terms of storage, so that the applications used can be run for mobile users who do not have large internal space or high processor capabilities [24]. This is done so that all students can access this learning media properly so that it can be run with minimal mobile devices. The results of the development of this mobile learning application are then tested to ensure the best quality in its development. The test is carried out using the black box testing method and has been carried out with satisfactory results. The test is then continued by doing usability testing to ensure the usability of the built mobile learning application [25]. The results of usability testing show that 88.8% is useful, 89.8% is easy to use, 89.8% is easy to learn and satisfaction with using the application is 89.1% and in the testing process, many students gave positive responses related to m-learning which was developed as a model. Database learning technology in vocational high school. From the various tests that have been carried out, we can confirm that this mobile learning application has good quality to be implemented.

Support Service Design

This application was developed with support services that can be accessed by both teachers and students through the database learning application website. This is done so that both students and teachers can be helped to overcome existing difficulties, increase competence, and self-confidence for students when they are going to study on their own [26].

Framework Implementation

The mobile learning activity framework that we have produced is trying to be implemented in the development of mobile learning. The implementation of this framework is tested on database learning in vocational high schools. The results of developing a mobile learning application using this framework have succeeded in building a mobile learning-based database learning application as shown in figure 3. The results of this mobile learning development adopt six components in the development of activity-based mobile learning.



Figure 3. Main Menu Display of mobile learning database

Mobile learning developed for use in database learning at the vocational high school level. This mobile learning application was built based on Android and has been successfully used in database learning in vocational high schools. The main menu consists of Materials, Quizzes, Assignments, and Application Guides. Learning outcomes are designed and included in each learning material that can be accessed easily using this mobile learning application.

In the development of mobile learning applications, many factors must be considered, especially to ensure that the mobile learning application can be adopted and well received by its users. Factors such as ease of use, trust, user culture are very decisive in the development of mobile learning applications[27][28]. The pedagogic aspect is also a factor that needs to be considered when mobile learning is used as a learning medium that is guided by teachers, especially in elementary schools [29][30]. In its development, it is very important to pay attention to the technology used. This relates to the various types of technology used in the learning process. The most important thing in the development of mobile learning technology is that the technology can be integrated into various available technology platforms [31][32]. Technically, this section requires adequate technical specifications so that the application integration process does not cause new problems that end in the failure of technology implementation. Mobile learning must bring an interesting learning experience in studying various materials widely in various fields including health, engineering, and other fields[33]. In the development of mobile learning, one must continue to pay attention to the development of mobile learning technology so that in its application it can produce applications that use the latest theories, concepts, and technologies in the topic of mobile learning [34][35]. Various advantages can be considered in building a mobile-based application that can be used in learning [36]. Technically, a mobile learning application must have sufficient technical quality to be implemented in learning [37]. We have succeeded in building an activity-oriented framework on mobile learning that can be proven to be successfully implemented in case examples of database learning in vocational high schools based on mobile learning.

4. Conclusion

We conclude that an activity-oriented framework has been successfully developed with the addition of a learning outcome component. The results of this modification have succeeded in building a new framework in the development of activity-oriented learning in mobile learning. This framework has been successfully implemented in database learning in vocational high schools and has succeeded in developing activity-oriented mobile learning applications. We succeeded in making the design to add more optimal learning outcomes to the mobile learning activity framework. The use of mobile learning activities is carried out with the steps of Learning Outcome Design, Requirements & Constraint Analysis, mobile Learning scenario design, technology environment design, and support services design. It is hoped that this new framework can be widely implemented in various learning models from various levels from elementary school to high school and used in the development of mobile learning-based learning media.

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