Mobile Based Learning Model in Response to Industrial Revolution 4.0 in Higher Education

Hermawan Syahputra[1], Restu[2], Syamsul Gultom[3], Sutrisno[4]
{hsyahputra@unimed.ac.id[1]}

Department of Universitas Negeri Medan, Indonesia[1,2,3,4]

Abstract. Mobile-based learning is learning that can be done anywhere and anytime through information technology. The purpose of this study is to develop a mobile-based learning model in higher education. This study refers to the design of ADDIE development which includes five stages, namely: Analysis, Design, Development, Implementation, and Evaluation. Based on the test results, the product is declared valid, and an effective and efficient learning model is obtained. Based on the qualitative and quantitative analysis, the appropriate learning model in higher education is through a combination of learning in class, and online learning assisted mobile. Mobile learning can be a complement to the lecture material given in class. Thus, mobile learning can function as a remedial and enrichment.

Keywords: Mobile learning model, industrial revolution 4.0, learning in higher education.

1 Introduction

The digital revolution is currently creating a combination of technology that eliminates the boundaries between physical, digital and biological elements (Schwab, 2016). The speed of this development occurs exponentially, not linearly, which is unprecedented in the history of industrial development, and has the potential to disrupt the industry globally (Schwab, 2015), including in education (see: Strayer, 2012; Bergmann and Sams, 2012; Roehl et al., 2013; Al-Htaybatet al., 2018). To overcome the disruption of technology, it is necessary to renew and adjust the graduates' competencies to meet global professional qualifications. This is important considering the current and future generations not only must be academically qualified but also must be very technologically aware (Al-Habyatet al, 2018). That is why they are referred to as digital natives, a term that shows their technological proficiency, natural relations with technology, and their involvement in digital culture (Prensky, 2001). However, learning will not be able to prepare the millennial generation to be natives in technology if learning itself does not absorb technology in its learning activities.

Interestingly, pedagogy in learning continues to evolve, including in the method of delivery of teaching materials, which are also being developed. Various potentials for creating active learning are now available with simple designs in addition to traditional lectures in the classroom. Educators in elementary, middle and high school have found innovative ways to restructure the class (Strayer, 2007) to focus attention on students (Bergmann & Sams, 2012). Among them are flipped classroom or inverted classroom. Flipped classroom adopts learning models that assign lecture classes or instructional content as homework. In preparation for

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class, students are asked to attend lectures. The time in class lectures is generally utilized by submitting problems, concepts, and involving students in collaborative learning (Tucker, 2012).

With internet access widely available in most colleges and universities, students can view web-based instructions whenever they have time, wherever they are, and in their way. This provides an opportunity to utilize the classroom only to confirm information from what is discussed in online lectures. Because students have actually gone through college before class, the time available in class can be focused on problem solving, skills development, and getting a deeper understanding of the subject matter (Bergmann & Sams, 2012). Thus, the lecturer can provide students with various learning opportunities that are student-centered in class and the interaction between lecturers and students becomes more efficient and quality. Peer mentoring and collaboration styles that can be built with mobile learning can increase Millennial student involvement in learning activities either in class or wherever they are(Prensky, 2010).

2 Literature Review

2.1 Industrial Revolution 4.0

The Industrial Revolution 4.0 is the name of the latest automation and data exchange trends in factory technology. This term includes cyber-physical systems, internet for everything, cloud computing, and cognitive computing (https://id.wikipedia.org/wiki/Industri_4.0,2018). This revolution was marked by an era of disruption, namely the emergence of online (digital) industries. Not just computers, mobile technology is endemic, and almost everyone is connected online. In this revolution, the role of innovation is to determine the competitiveness of a product on the market. And apparently, there is a gap between industries that are dependent on innovation and labor readiness. Many job providers find it difficult to find human resources which have literacy skills (read, write and count) as well as data literacy (big data), technology literacy (coding, and understanding of AI) and human literacy (humanities, communication, and design).

2.2 GEN-RI 4.0

GEN-RI 4.0 stands for General Education + Industrial Revolution 4.0. The principle is that literacy from general education collaborates with data literacy and technology in the curriculum. Also, there is a new technique in dealing with the development of science and technology that is very fast, namely the concept of lifelong learning. Students are expected to continue updating their knowledge following the latest developments in science and technology.

Our country is trying to combine conventional learning with online, known as the blended learning facilitated by the Online Learning System (SPADA) and the IdREN network (backbone). SPADA applies many new methods related to online learning such as Hybrid Credit Transfer

• Pioneering Cyber University;
• Regulators and quality assurance of PJJ (online learning);
• Innovative-based learning;
• Flip learning;

• and Super Faculty.
Based on the description above, it can be concluded that the concept of lifelong learning requires lecturers to study for life. This means that educators must constantly develop themselves sustainably to adapt their instructional designs to technological developments and industrial revolutions. Because the industrial revolution will automatically change the pattern of human life including student learning patterns. Thus the teaching staff must adjust to remain able to produce quality learning amid dynamic student learning styles due to technological disruption.

2.3 Mobile Learning

Mobile Learning (M-Learning) is unique learning because learners can access learning materials, directions and applications related to learning, anytime and anywhere. This will increase attention to learning material, make learning pervasive, and can encourage learner motivation for lifelong learning.
Using m-Learning enables more opportunities for collaboration on an ad hoc basis and interacts informally between learners. Mobile learning is a learning model to respond to the development of the world of information and communication technology, especially information technology and mobile communication, which is very fast cannot be denied one of the devices that is closely related to everyday life. Mobile learning is an intersection of mobile computing and e-learning that provides:
a. Resources that can be accessed from anywhere,
b. A powerful search system capability,
c. Rich interaction, full support for effective learning and performance-based assessment.
d. Alternative learning models that have characteristics do not depend on location and time. The alternative model is also expected to be able to provide knowledge sharing facilities and visualization of knowledge, so that knowledge becomes more interesting and easily understood.

Some important abilities that must be provided by the m-Learning learning tool are there
a. The ability to connect to other equipment (especially computers),
b. Ability to present learning information and
c. The ability to realize bilateral communication between teachers and learners.

3 RESEARCH METHODS

This research uses development research methods. The purpose of development research according to Borg and Gall (1983) is to develop and validate educational products.Educational products are not only in the form of material, such as textbooks, learning videos, etc., but also include referring to existing learning methods and processes, for example, learning models or methods of organizing learning (Borg dan Gall, 1983).The development carried out in this study is the development of learning models. The learning model was developed by adopting information technology into the whole learning process. The model developed will be general so that it can be adapted to various subjects. The development procedures used are limited to limited trials to produce prototypes 1. Continuous development is needed during the

implementation of the model that has been developed. The sustainable development certainly requires further study until best practices are obtained.

The development of the learning model was carried out referring to the development procedures of Borg and Gall (1984) and Plomp and Nieveen (2013) but limited only to the validation and trial stages. The results of the development in the form of a final prototype that has gone through a series of validation and trial stages are then implemented and evaluated to obtain continuous improvement so that the model that has been built has reliability in the implementation of mobile-based learning.

The activities carried out during the development process are:

a. Needs Analysis: The activity begins with an analysis of the situation and problems that occur in learning activities in the UNIMED environment. The results of the situation analysis are then reviewed theoretically based on developing theories and researches.

b. Development: The results of the needs analysis are then used as the basis for the development of a mobile-based learning model. The relevance in this context is the suitability of the problem with the theory used to build the learning model. The activity begins with designing a learning model by considering the findings of the latest research and adapting the product from the research. Design adaptation from previous development research was carried out in the hope that the adapted model had good validity and reliability. Although in this study the learning model remains validated to guarantee its success. The design of the model that has been determined for use is then constructed into a mobile learning model. The model that has been built is then realized into learning tools, namely RPS and Lecture Contracts. Instrument that has been built at this stage is categorized as prototype 1.

c. Product Trial: Prototype 1 which was produced at the realization stage, then tested for validity by 2 experts from Medan State University, North Sumatra. Based on the results of this validation test, a small revision was then made to obtain a mobile-based learning model in the form of a prototype 2. After the prototype 2 was obtained, then a field trial was conducted. Field trial activities are divided into two aspects, namely 1) reviewing students' understanding of the model that has been built; and 2) reviewing the level of student satisfaction related to the learning model used. The results of the trial were used to evaluate the performance of the learning model and further improvements were made.

3.1 Data Analysis

The development of this learning model has good quality if it meets aspects of validity, practicality, and effectiveness.

1. Valdity: The validation results of the validator about the learning model were analyzed descriptively, then compared with the validity of a learning model. The learning model is declared valid, if it meets the following criteria.

a. More than half (50%) of validators state that the learning model has a strong theoretical basis.

b. More than half (50%) of the validators stated that the learning model component was feasible

c. The results of the trial show that the linguistic component fulfills the good and right language.

2. Activism: the learning model is said to be practical, if it meets the following criteria.

a.More than half (50%) of validators give consideration that learning models can be applied in class.

b.Lecturers say they can apply the learning model in the classroom.

3. Effectiveness: the effectiveness of teaching materials seen from the viewpoint of students by testing one to one in the classroom.

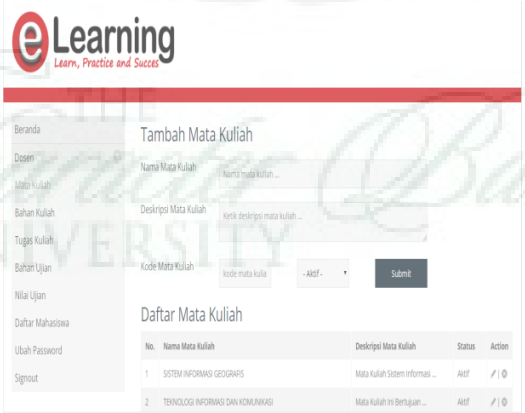
4 RESULTS AND DISCUSSION

4.1 Results of Needs Analysis

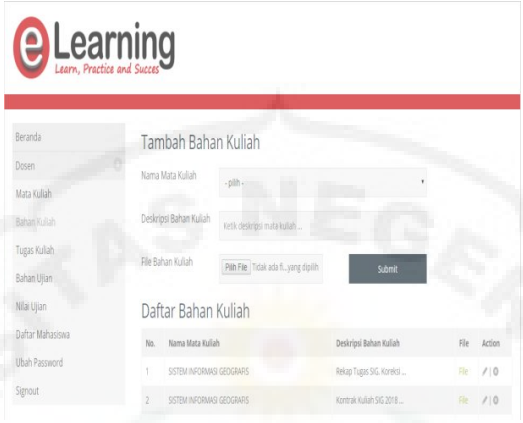
Need analysis is done by giving questionnaires and observations to students and lecturers. The results obtained from questionnaires that have been conducted regarding learning activities show that 86% of students need more teaching resources. The tightness of lecture time and the many assignments given by lecturers make students not have much time to find teaching resources both in the library and through the internet. The need for Android use in learning media is 90%. The results of the needs analysis questionnaire show the ability of lecturers and students to operate the android is very good. Learning facilities such as laboratories have been used when practicing, while LCDs, wifi, or hotspots already exist, but have not been used in learning activities to the fullest. The use of media is still dominated by limited worksheets or media.

4.2 Results of Product Development

The product development carried out was the development of m-Learning media as a blended in learning. This stage is after the needs analysis. The product development process is carried out in several stages, namely collecting materials in the form of materials from valid sources and making material presentations and material mastery test questions. The M-Learning consists of a summary of the subject matter and enrichment that is equipped with competency standards, basic competencies, indicators, learning objectives, relevant learning videos, sample questions, practice questions, and competency tests to measure student success. M-Learning is made so that students are more interested and easy in learning material. Mobile learning products are built to strengthen learning. Mobile learning products that have been developed can be seen as in Figure 1.

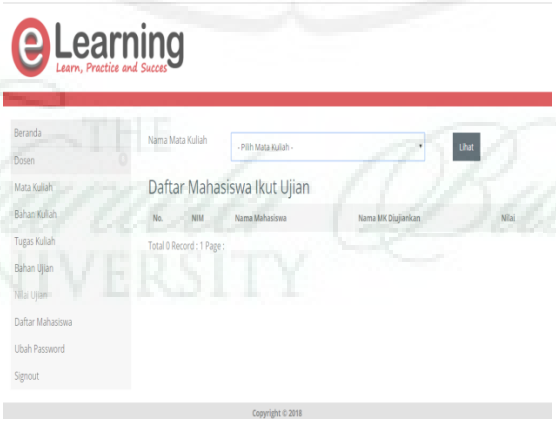


a. Menu of Lecture



b. Menu of Material Subject

c. Menu of Lecture Task



d. Menu of Test Result

Fig. 1. Menu on mobile-based online learning

4.3 Validity Test

Based on the material expert test instrument which was filled by material experts in the form of questionnaires, obtained improvement suggestions, namely adding material was still too minimal, correcting writing errors, and replacing images from everyday life. Based on the design expert test instrument that has been filled by the design experts in the form of questionnaires obtained improvement suggestions as follows: 1) Pay attention to the rules of IT media development, 2) Improve the writing of letters and writing is expected to be constant, 3) Fix unclear writing, 4) The size of the writing on the evaluation question is enlarged, 5) Add a background image to the instructions for use, 6) The color of the discussion question simply uses black, 7) Fix the instructions on the video, 8) Change the image to the problem according to daily life.

4.4 Field Test

Field tests were conducted in class A of Computer Science Study Program 2018/2019 Academic Year. At this stage, students use the media individually (independent), then are given a questionnaire to state whether the media is interesting, easy to use and helps students in learning. This stage aims to find out the improvements or shortcomings of the m-Learning media developed before the trial phase of the operation of the product in small groups. A summary of student responses and assessments of the use of m-learning can be seen in Table 1.

Table 1. Student Response and Assessment of the Use of M-Learning

Assessment	Value	Qualitative
Attraction	3,12	Interesting
Ease of use	3,74	Very easy
Benefit	3,61	Very helpful

4.5 Effectiveness

Product effectiveness testing is done by giving a test to students. Test questions have 20 items by adjusting the indicators that have been made. After testing the effectiveness of students who have used Android-based m-learning, the researchers obtained student test results from the cognitive aspects. The product is said to be effective if more than 77.14% of students complete the KKM. The percentage value of the effectiveness of the product is converted into a score of the quality value statement so that a score of 3.08 is obtained which means that the product is in a good and effective category to be used as a learning medium.

5 CONCLUSION

Based on the research that has been done regarding mobile-based learning (m-Learning), it is concluded that: 1) Produced m-Learning products as ablendedlearning model in universities that have validated their suitability; 2) Test results of the design, material test, and field test of the product so that the product is declared feasible and can be used as a blended

learning model and the product has also been tested through field testing along with seeing the response and assessment of students on product use; 3) m-Learning media as a tools of blended learning model has good attractiveness with a score of 3.12, excellent ease of quality with a mean score of 3.74, very good quality of usefulness with a mean score of 3.61; 4) m-Learning media as tools of blended learning model are declared effective to be used as learning media.

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